

Michael Sherring-Lucas/Paul Martin

Attachments for prosthetic dentistry

Introduction and application



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Part I Introduction

“those who are enamoured of practice without science are like a pilot who goes into a ship without rudder or compass and never has any certainty where he is going.”

Leonardo da Vinci

Introduction Attachment?

An attachment is a mechanical connector made up of two or more parts. The part is connected to a tool which is an implant. The attachment is an intermediate part and is used to provide resistance connection between the tool and the new part attached. This tool can be of varying sizes and the attachment can be of varying sizes.

The purpose of this manual is to provide basic information on the use of attachments and associated techniques and is essentially compiled for the Technician with limited knowledge of the subject. There are those with greater experience who will hopefully derive useful information which will enable them to improve their understanding of attachment work, planning and technique application.

Attachments in one form or another have been used for many years and are not new by any means as there is evidence of wire and riveted devices dating back to the Egyptians. However, we are concerned with modern forms ranging from simple slides to sophisticated assemblies with many micro engineered parts fabricated in different alloys for different purposes.

Types of Precision Attachments

- Uniaxial (Fig. 1)
- Triaxial (Fig. 2)
- Rotational (Fig. 3)
- Box (Fig. 4)

How are Precision Attachments Connected

- Friction (Fig. 5)
- Mechanical (Fig. 6)

- Models (Fig. 7)
- Sections (Fig. 8)

The Functions of Precision Attachments

- Control
- Force
- Resistance
- Force

Cendres & Métaux SA precision attachments are all prefabricated, machined to very fine tolerances and have a very precise smooth action. Usually they are adjustable, some have replaceable parts, others have a variety of uses such as conversion from friction retention to snap retention. In addition there are those that are either resilient or non resilient. Non precision forms of attachments usually involve plastic pieces made in non-residual combustible plastic.

To assist the reader the manual is divided into two sections. The first section is primarily concerned with descriptions of equipment, materials and techniques associated with attachment work and the second part is compiled alongside the Cendres & Métaux SA catalogue dealing with each classification in order.

Choosing a Precision Attachment

- Use the chart below to help you decide which type of attachment would be most appropriate for your work.
- Decide which is the best for your situation.
- Refer to Fig. Cendres & Métaux SA Catalogue to find the attachment company with which you wish to work.

What is an Attachment?

An attachment is a precision connector made up of two or more parts. One part is connected to a root, a tooth or an implant. The other part to an artificial prosthesis, and is used to provide mechanical connection between the two. For the most part attachments take the place of damaging clasp arms but can also be used to retain full or partial dentures on root anchors carrying studs or bars.

Precision attachments offer the following additional advantages.

- Standard interchangeable parts
- Adjustable
- Controlled wear
- Less wear
- Easy to repair

Indications for Precision Attachments

- Fixed bridgework – Intracoronar attachments on non-parallel abutments.
- Partial dentures
- Overdentures
- Unilateral or bilateral free-end dentures

Types of Precision Attachments

- Intracoronar (Fig. 1)
- Extracoronar (Fig. 2)
- Radicular Stud (Fig. 3)
- Bars (Fig. 4)

How are Precision Attachments Connected

- Friction (Fig. 5)
- Mechanical retention (Fig. 6)

- Magnetic (Fig. 7)
- Screwed (Fig. 8)

The Functions of Precision Attachments

- Screwed
- Rigid
- Hinge resilience
- Vertical resilience
- Rotational

What is the Life Expectancy of an Attachment

Used in the correct manner, normally 7 – 10 years, often longer.

How do you Achieve the Best Results

- Correct treatment, planning and evaluation.
- Teamwork between the Dental Surgeon and the Dental Technician.
- Regular adjustment of the attachments.
- Regular relining of prostheses and good oral hygiene.

Choosing a Precision Attachment

Use the chart below to help when deciding which type of attachment would be suitable for the case in hand.

Decide which of the four types (Intracoronar, Extracoronar, Stud or Bar) as shown below would be suitable.

Refer to the Cendres & Métaux SA Catalogue to find the attachment(s) complying with your choice.

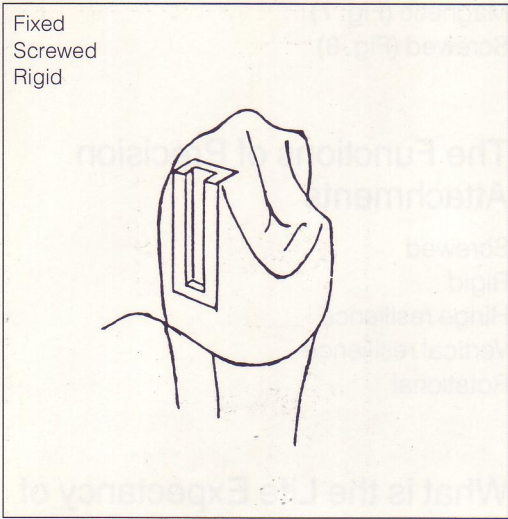


Fig. 1 Intracoronal

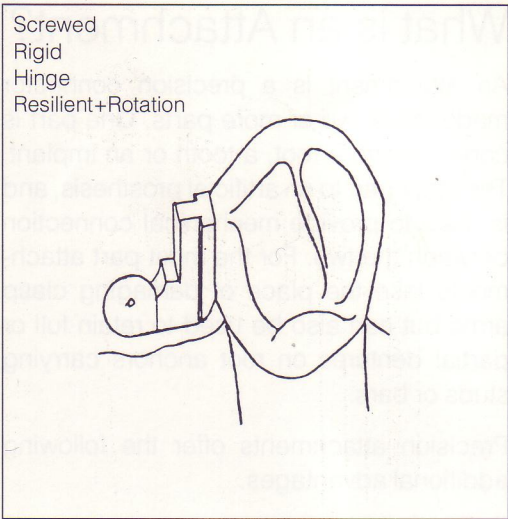


Fig. 2 Extracoronal

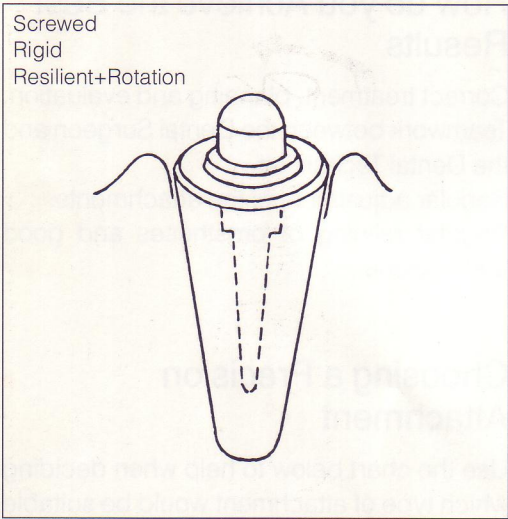


Fig. 3 Radicular

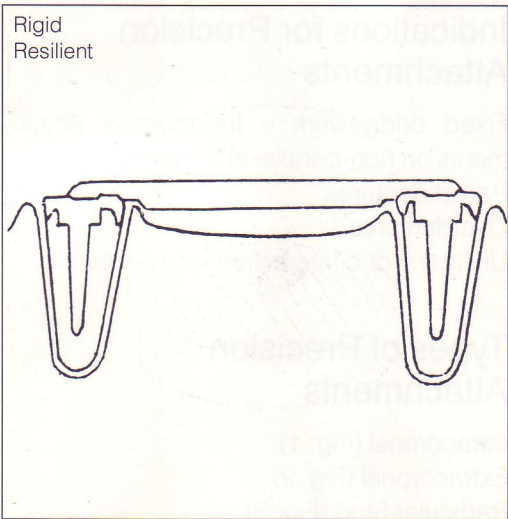


Fig. 4 Bar

Once this choice has been made, decide then which connection you require.

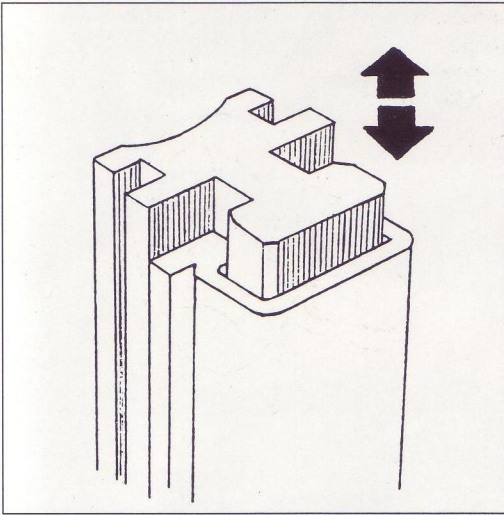


Fig. 5 Friction

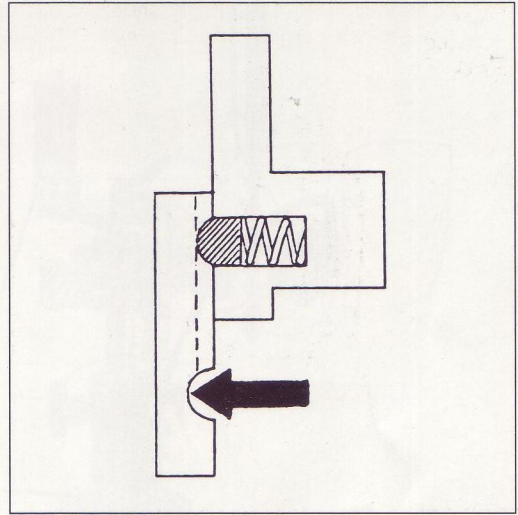


Fig. 6 Retention

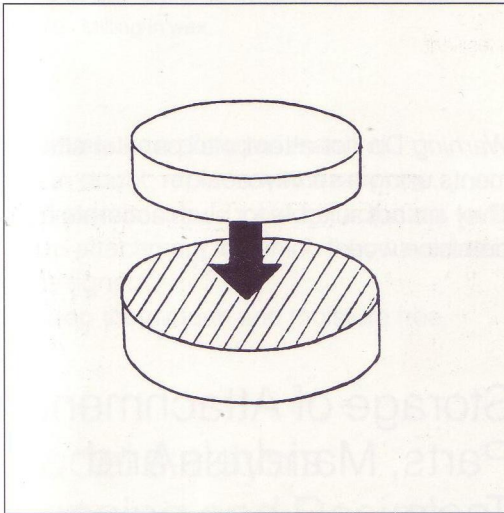


Fig. 7 Magnetic

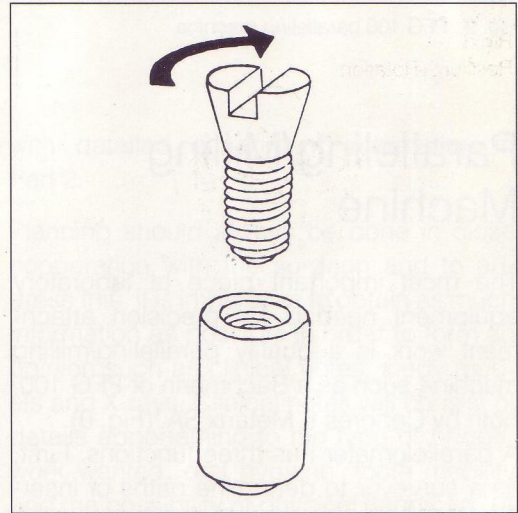


Fig. 8 Screwed

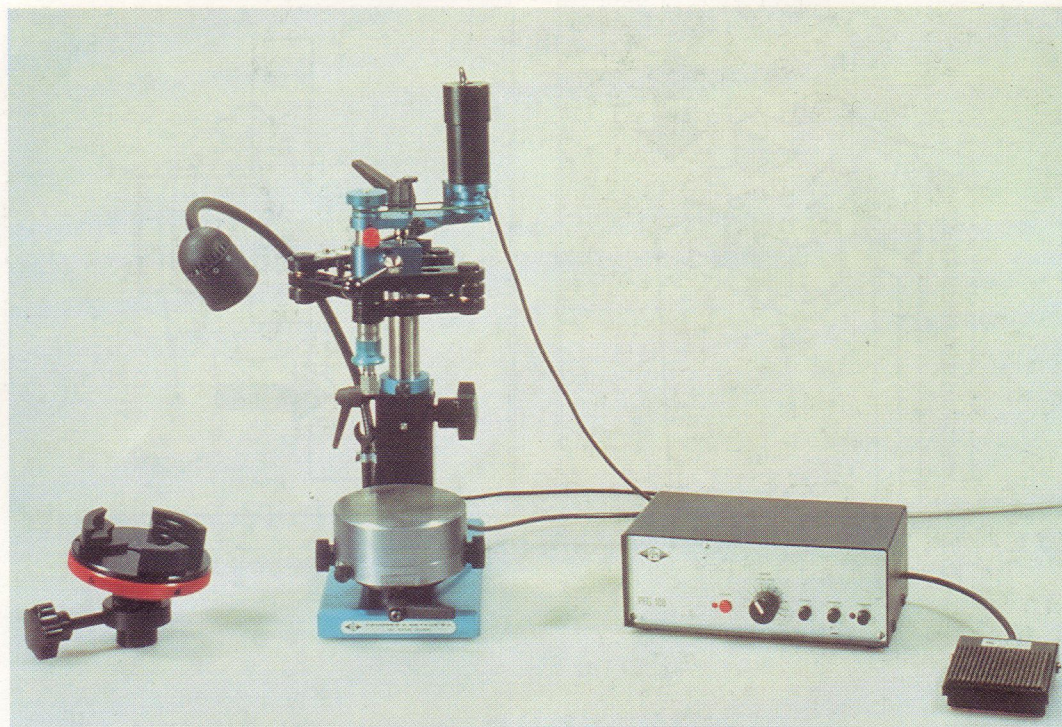


Fig. 9 PFG 100 paralleling machine

Paralleling/Milling Machine

The most important piece of laboratory equipment needed for precision attachment work is a quality paralleling/milling machine such as a Bachmann or PFG 100, both by Cendres & Métaux SA. (Fig. 9)

A parallelometer has three functions. First, as a surveyor to determine paths of insertion. Secondly, to align attachments or other assemblies to an extremely high level of accuracy and finally milling, a process of wax (Fig. 10) or metal (Fig. 11) in-line, angled or parallel shaping to given contours depending upon the type of work, with the added advantage that it can be used for angled or parallel drilling.

Warning Do not attempt to parallel attachments using a surveyor.

They are not suitable for such accurate high precision work.

Storage of Attachment Parts, Mandrels and Tools

It is recommended that all attachment components, mandrels and adjustment tools are stored in a miniature drawer system, are clearly identified and numbered. To reduce the risk of mixing parts only one drawer should be opened at a time.

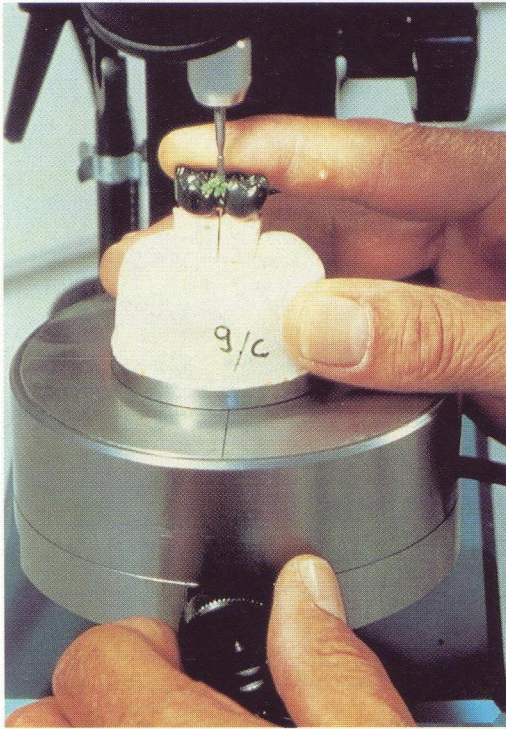


Fig. 10 Milling in wax

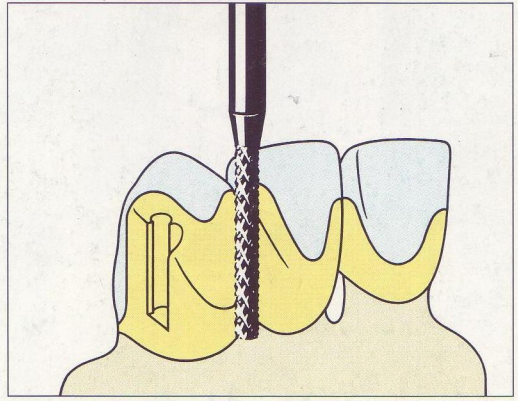


Fig. 11 Finishing metal

- a) Never use a distorted mandrel.
If in doubt, replace with a new one.
- b) Mandrels should only be adjusted to fit the attachment for which they have been designed.
- c) Keep them clean and moisture free.

Model Analysis Planning and Design

Undertaking planning is complex and primarily for the experienced technician with an extensive knowledge of attachments and associated techniques. It is because of this, that random samples of design illustrations and explanations are shown below

with detailed attachment information in Part 2.

Planning should always be done in close cooperation with the surgeon and to address this, it is imperative to obtain as much information as possible in order to form an opinion such as clinical notes, study models and X-rays. Clinical notes will consist of details appertaining to the type of bridge-work wanted, oral hygiene, tooth mobility and the possibility of physical handicap. (A patient with severe arthritis in the hands would be an unsuitable candidate for patient removable unilateral saddles).

Study models enable the technician to appraise the dentition, vertical dimension, spaces to be filled and clearance for attachments.

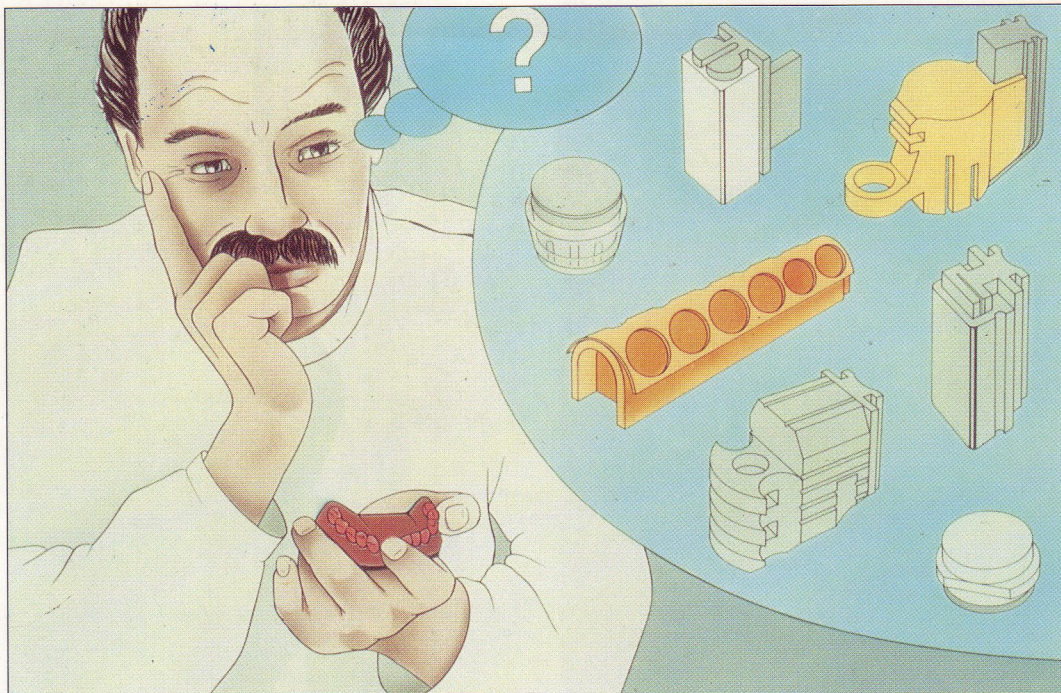


Fig. 12

All valuable information when designing complex work.

X-rays, though less important to the technician, can provide useful information regarding bone loss, root angles, areas of hard and soft tissue and in some cases whether or not a tooth, which has broken down, should be incorporated in a design or extracted to improve rather than compromise the design.

Model analysis is the means by which a technician can ultimately determine the type of attachment to use for a given set of circumstances.

Whilst analysing study models, consideration must be given to the length of the free end saddles when selecting attachments. As a general rule long saddle selections are usually designed as bilateral cases with

rigid attachments and short saddle sections as unilateral or bilateral patient removable prosthesis supported on hinge or rigid attachments.

However, with unequal length saddles only rigid attachments may be used in a bilateral prosthesis.

Only AFTER studying the model should a plan be conceived and the following observations considered:

- 1) Oral hygiene.
- 2) Number of abutments.
- 3) Angle and height of abutments.
- 4) Length of free-end saddles.
- 5) Vertical height.
- 6) Guidance planes.
- 7) Ridge structure.
- 8) Possible physical disability.
- 9) Type of attachment – Rigid or resilient.

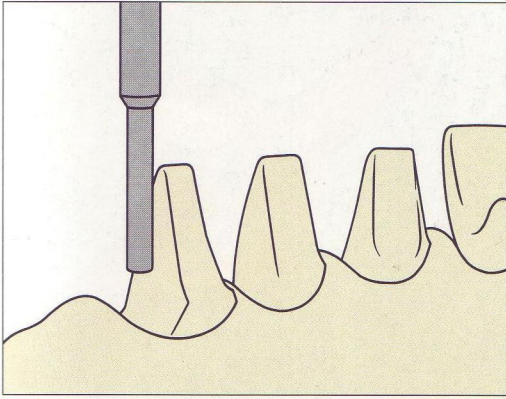


Fig. 13 Model analysis

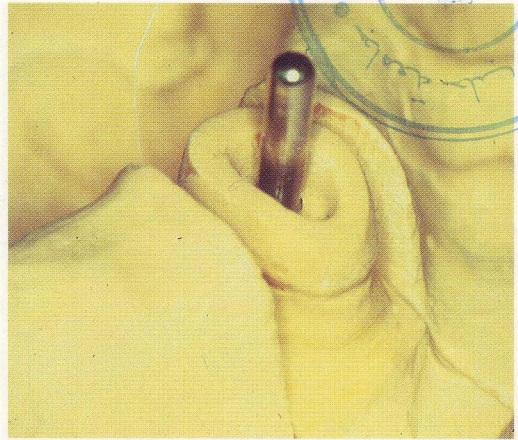


Fig. 14 Root anchor preparation

Types of Preparations

Essentially there three basic types of preparations suitable for attachment work. Root anchor, intracoronaral and extracoronaral.

1. Root anchor

Root anchors play a large and important part in the design of removable and fixed appliances and therefore the following points must be observed to obtain maximum retention and stability.

- Maximum length post consistent with the length of the root.
- A preparation at gum level to keep the fulcrum point low. (Fig. 14)
- Bevelled shoulder diaphragm for increased retention.
- Anti rotation slot or well.
- Use of a Cendres & Métaux SA post system for preparation and impression technique.
- Cast-on wrought post.

Causes of failure

- Post too short.
- Inadequate diaphragm.
- Using a cast post.
- Not using a recognized post system.
- Failure to heat treat.

2. Intracoronaral

Intracoronaral preparations (Fig. 15) are made to accept an attachment within the circumference of the coronal surface thus reducing the stress on the attachment and leverage on the tooth. In order that the correct size box is cut, it is essential the clinician is made aware of the type of attachment and it's overall dimensions and to ensure complete casting-on, diffusion and correct alignment the box should be enlarged by approximately 0.6 mm x 0.2 mm in width and depth respectively. Also, preparations should be reduced sufficiently on the lingual/palatal wall to allow for a milled bracing arm. See "Design and use of bracing arms".

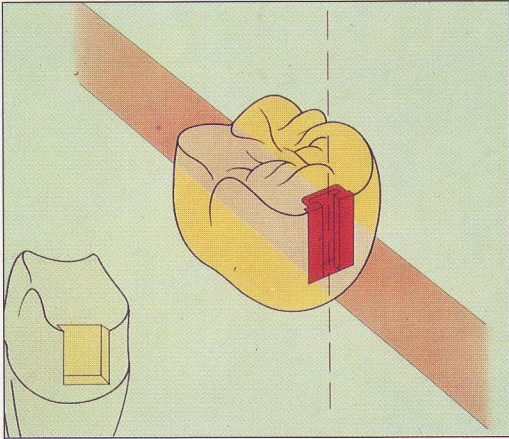


Fig. 15 Intracoronal preparation

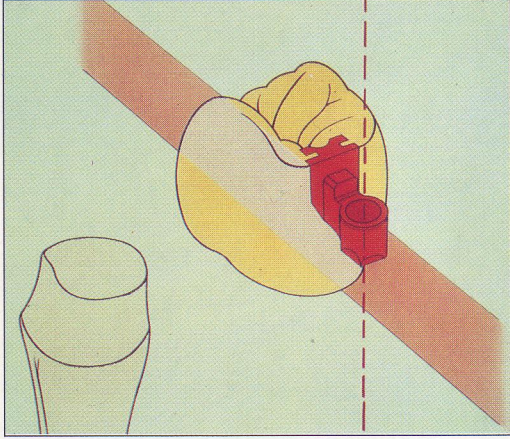


Fig. 16 Extracoronal preparation

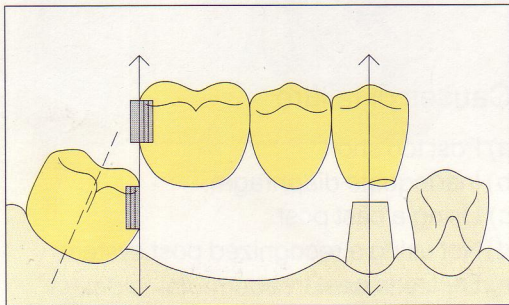


Fig. 17 Posterior bridge link. Beyerler 21.03

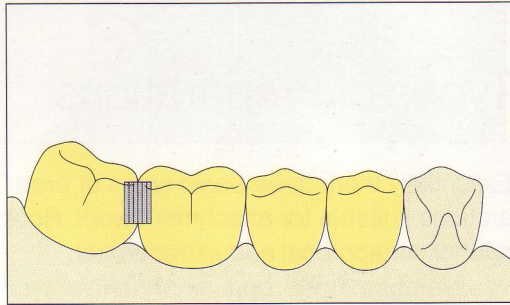


Fig. 18

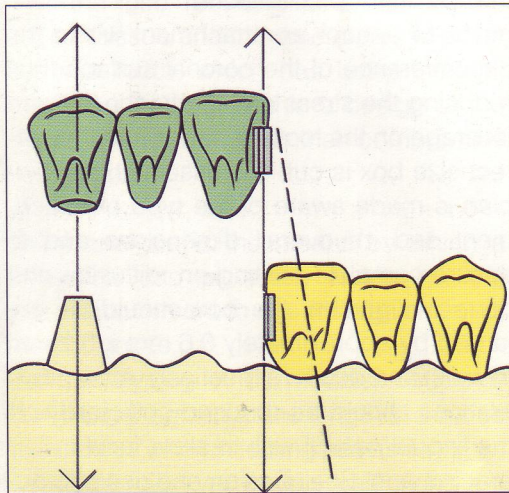


Fig. 19

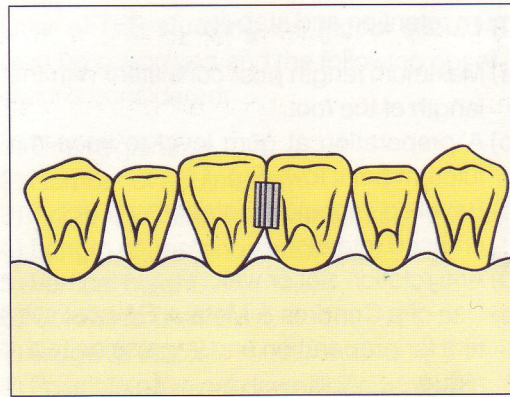


Fig. 20 Anterior bridge link. CM-Interlock 22 01

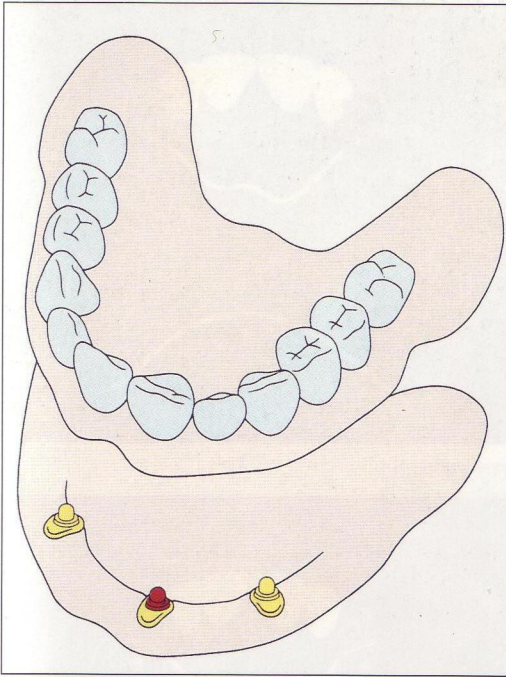


Fig. 21 Cylindrical friction (retention) anchor.
Dalbo 41.02

Potential cause of problems

- a) Non-alignment of box to other abutment teeth.
- b) Inadequate size of box.

3. Extracoronal

A preparation suitable for an extracoronal attachment (Fig. 16) is a conventional abutment preparation, which allows for an attachment to be situated outside the coronal circumference of the tooth.

Points to observe

- a) The preparation walls are near parallel sided to maximize retention of the crown.
- b) Preparation has sufficient depth to carry an extracoronal attachment.

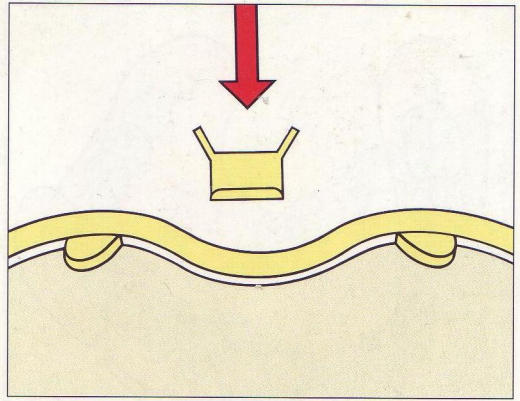


Fig. 22 CM-Bar 55.01

Selection of Ideas for Designs

This section is intended to give the reader an insight into design concepts by illustrations and types of attachment used. For more detailed information on attachments see Part 2.

1. Using slide attachments (Figs. 17-20) to correct malalignment of preparations requires only an elementary ability.
2. Post anchors to retain a denture. (Fig. 21)
3. Post and round bar retention for denture. (Fig. 22)

This type of bar has a small cross section allowing for use in all cases especially with very close bites.

4. Post and oval bar retained denture. (Fig. 23)

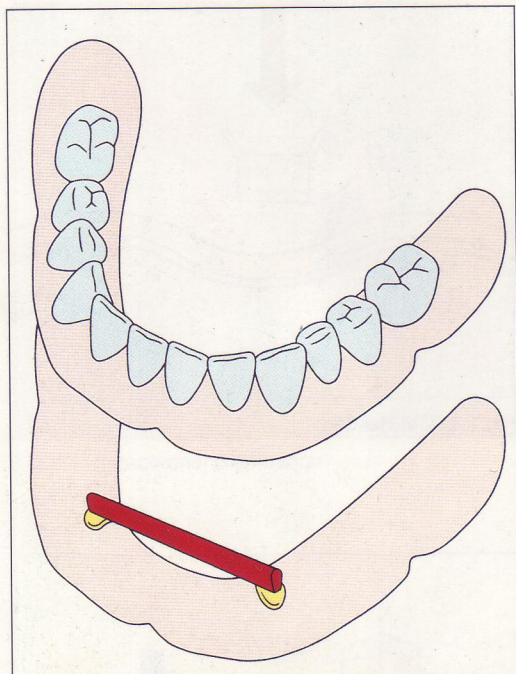


Fig. 23 Dolder Bar 53.01.

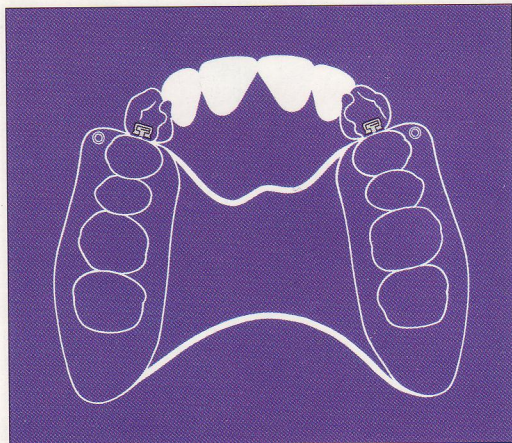


Fig. 24

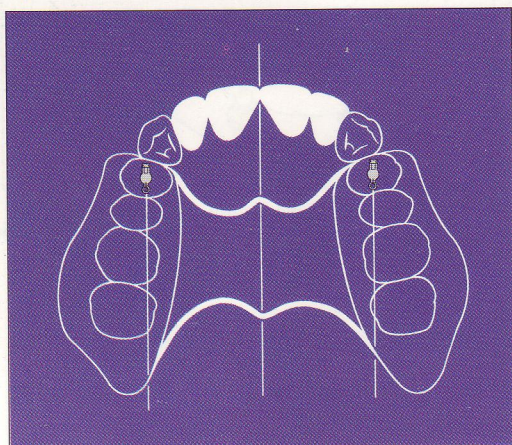


Fig. 25

Hybrid Cases

Hybrid cases are those with a mixture of bridge and denture work. They are usually complex, requiring considerable technical and occasional innovative skills. The following illustrations show a variety of options for the same case. Standing teeth are 321|123

Option a) A chrome bilateral prosthesis supported on slides carried on crowns 3|3 using McCollum 22.03, PT-Snap 22.09 or

Biloc 22.10 adjustable slides with bracing arms and stabilizers. (Fig. 24)

Option b) A chrome bilateral prosthesis supported on slides carried on crowns 3|3 using Dalbo-S 63.05 adjustable, resilient hinges or Mini-Dalbo 83.01 adjustable hinges. (Fig. 25)

The above designs are all acceptable and are dependent upon:

- Available space for attachments
- Patients preference
- Patients dexterity
- Oral hygiene

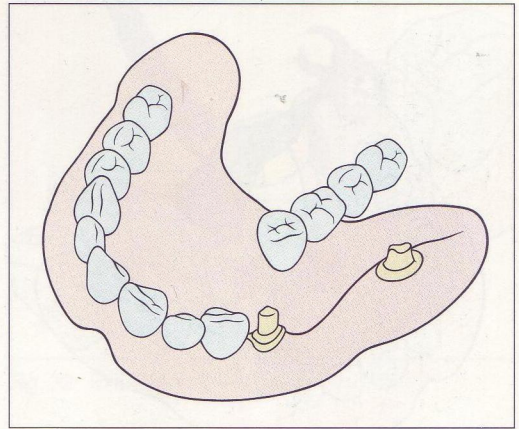
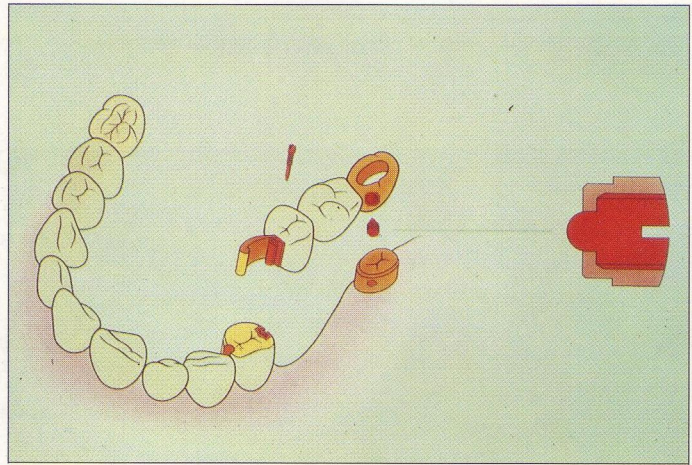


Fig. 26 Simple fixed bridge

Fig. 27 Modified advanced design allowing for the loss of $\underline{7}$.

Prospective Planning

1. With the knowledge that the life expectancy of the $\underline{7}$ is short, a simple fixed bridge (Fig. 26) can be designed in such a way, that in the event of the $\underline{7}$ being lost, then part of the structure can be re-used in a future design, e. g. a bilateral prosthesis.

The elements that make up the modified bridge are:

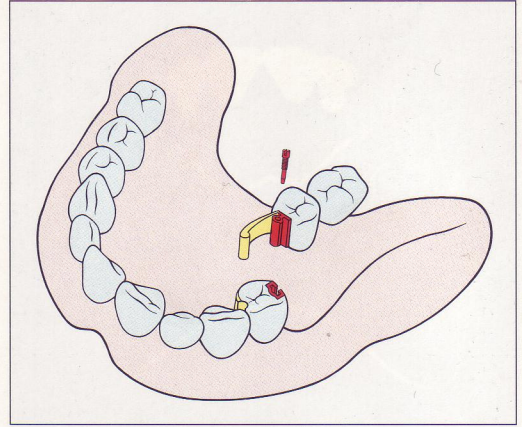
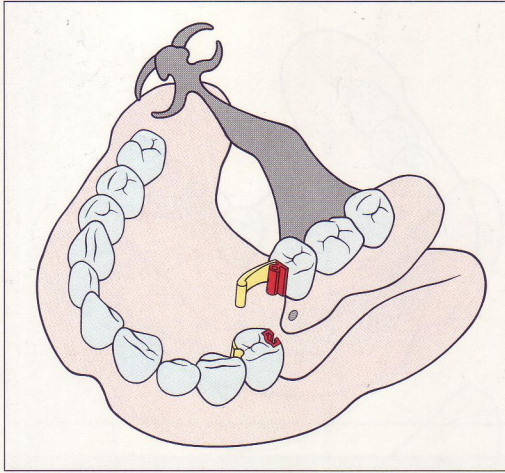
a) CM 24.01 Combi-Snap screw slide which can be converted from fixed to

retention by changing the screw on the $\underline{4}$.

b) The telescope crown includes an Ipsoclip SE 144.02 (screw retention) on the $\underline{7}$.

c) Milled brace support. (Fig. 27)

It can be seen, that by releasing the screws the pontic section and bracing arm can be removed and upon extracting the $\underline{7}$ the bracing arm and Combi-snap attachment are re-usable. A shorter screw is inserted into the slide to allow it to be used as a retentive element in the new design.



Figs. 28–29 Simple unilateral design utilizing original elements

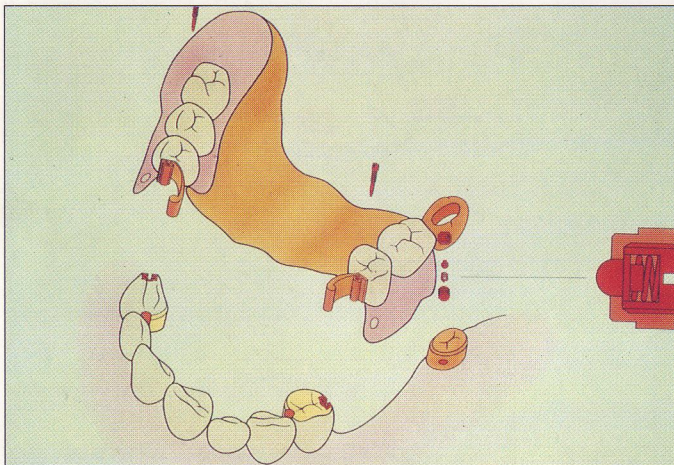


Fig. 30

2. For this exercise we will consider the implications of leaving the 7 in place and losing the 456 (Fig. 30)

To utilize the existing bridgework it is necessary to crown the 3 and use a matching Combi-Snap slide with a bracing arm to carry the 456 joined by a small

plate to the bridge 7654 and complete the prosthetic work. Changes to the screws must be made as follows:

- Combi-Snap. Exchange the locking screws to spreader screws.
- Ipsoclip. Exchange the SE screw for a RE spring stud.

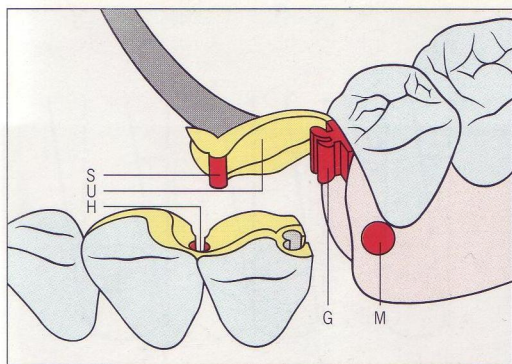


Fig. 31 Intracoronal

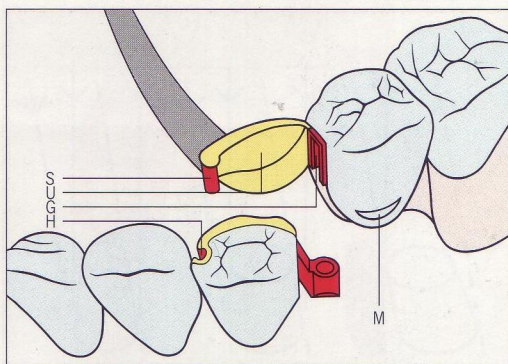


Fig. 32 Extracoronal

Milled Brace Support

See "Guide to milling alternative methods" in Part 2.

Experience has shown, that all adjustable slide attachments with the exception of the CM SG series need bracing arm support in partial bilateral and unilateral design to provide additional stabilization.

The stabilizer protects the attachment against the effects of torsion-rotation and leverage forces. Both stabilizer and attachment must be parallel to each other.

To allow slide attachment and stabilizer to become a functional unit, the stabilizer (S) and the slide part of the attachment (G) must be connected by a cast bracing arm (U). The corresponding support is milled lingually-palatinally on the most distal abutment or pontic, possibly slightly conical in relation to the line of insertion. The cervical finishing line should be lower than the attachment but still a minimum of 0.5mm above the surrounding tissue. This will guide and facilitate the insertion of the denture. A button or an undercut groove (M) on

the mesial side of the first denture tooth facilitates removal of the denture for the patient. (Figs. 31–32)

The stabilizer can be individually milled or made from prefabricated parts (Bar sleeve, Plasta or Interlock by Ceccato) and positioned on the opposite side of the attachment (Fig. 33) and measure 2/3rds the depth of the milled surface of the crown or into the interdental space in bridges.

In the case of an extracoronal attachment with limited vertical dimension it is recom-

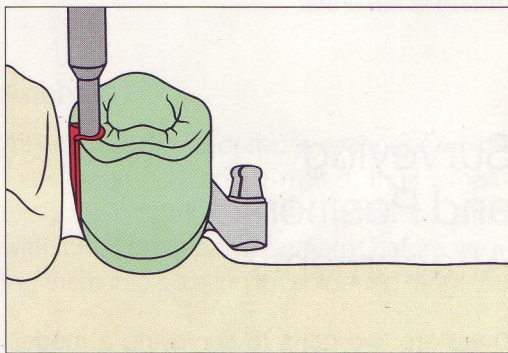


Fig. 33 Waxed up stabilizer.

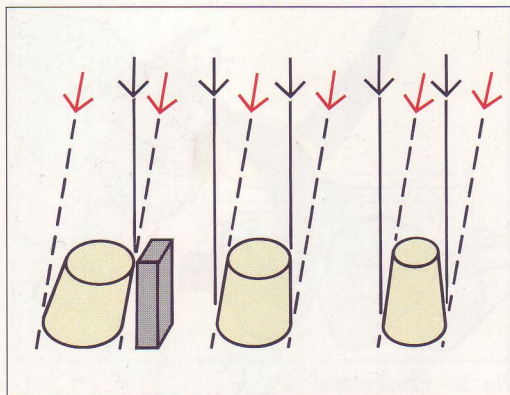


Fig. 34

-----< Survey line.

———< Common path.

Note malaligned 7 |.

Therefore the slide is aligned to a path common to 53 |.

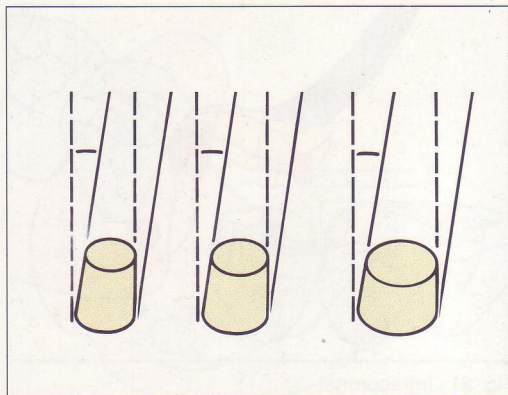


Fig. 35

-----< Survey line.

———< Wide angle/path of insertion common to all preparations.

mended, that an occlusal metal extension is included above the housing, also it is advantageous to gum fit the first tooth of the denture to improve self cleansing qualities. (Fig. 32). Bracing arms are generally cast as a separate unit with retention into the acrylic work or, in the case of a chrome cobalt prosthesis, cast as an integral part of the chrome work. In some instances involving prospective planning milled brace supports are fabricated for future use and remain dormant until such time as they are needed.

To perfect this technique a knowledge of milling is essential.

Surveying and Positioning Attachments

There are two parts to surveying a model. First, to establish correct parallelity of teeth

and secondly to find a path of insertion common to all abutment teeth. Both exercises are done with a parallelometer using surveying rods. In the first instance it is necessary to ensure correct alignment of the preparations and, in the event of malalignment, a slide attachment should be introduced and the final bridge made in two parts. (Fig. 34) Secondly, if all the abutments are reasonably parallel, a path of insertion should be established by taking an angle from the side of the abutment showing the least angle of tilt, resulting in a common path of insertion, (Fig. 35) determining an angle/path of insertion common to all preparations.

Only after surveying a model should attachments be introduced

Rigid attachments.

Rigid attachments must always face the direction of the ridge. (Fig. 36)

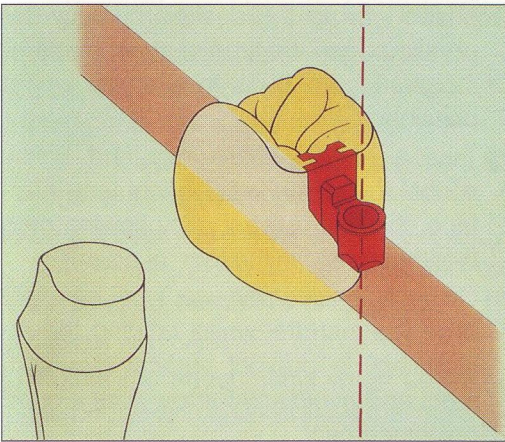


Fig. 36 Rigid attachments must always face the direction of the ridge.

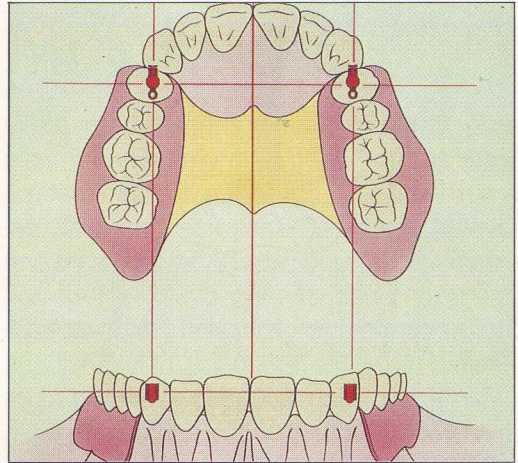


Fig. 37 3-D Position of hinges.

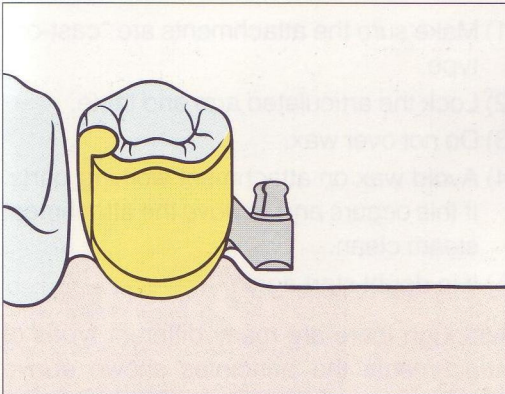


Fig. 38 Attachment showing clearance.

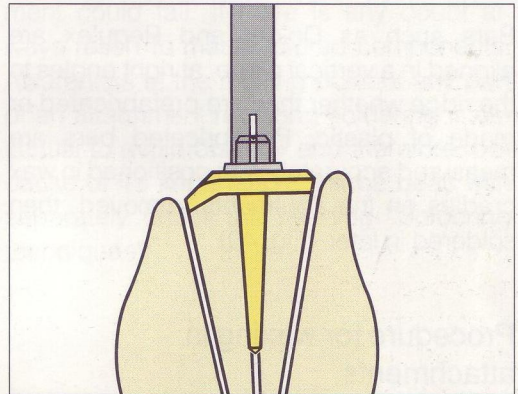


Fig. 39 Anchor alignment with parallelometer.

Hinge attachments. See Part 2 "Mounting hinge attachments".

Hinge attachments must be positioned three dimensionally, that is in both vertical and horizontal planes. (Fig. 37)

Care and consideration must be given to ensuring, that there is sufficient space (approx 1.0mm) under attachments for wax contouring and oral hygiene. (Fig. 38)

Anchors

All anchors are soldered to root caps which have been horizontally milled, thus simplifying their positioning, and must be sited with the aid of a parallelometer before waxing them into position for soldering. (Fig. 39)

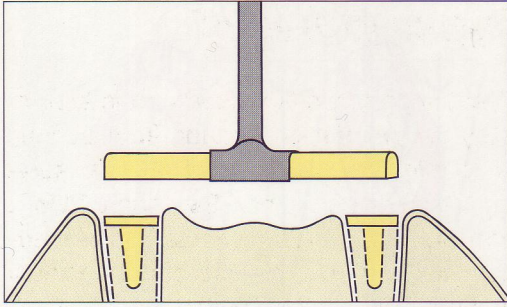


Fig. 40 Aligning a Dolder bar to wax copings.

Bars

Bars such as Dolder and Regulex are aligned in a vertical plane, at right angles to the ridge whether they are prefabricated or made of plastic. Prefabricated bars are measured accurately and positioned in wax cradles on the abutments, removed, then soldered in later. (Fig. 40)

Procedure for waxing in attachments

- Using the ball and socket table of the paralleling machine ascertain the line of insertion and lock the table. This position is maintained throughout for both attachments and milling. See part 2. Model construction.
- Place the attachment in the mandrel making sure it is properly seated.
- Loosen the articulated arm and move the attachment into position.
- Lock the articulated arm for both vertical and horizontal movement.
- Build-up wax behind the attachment being careful not allow wax to encroach on the attachment.

- Shape wax to the desired contour depending upon the type of attachment remembering to build in strength where possible.
- Take a needle sharp tool and lightly scribe round the wax/attachment interface, this will prevent alloy flowing onto the attachment in the form of a skin.
- On completion of the wax work carefully raise the mandrel whilst holding the attachment to prevent vertical displacement and *avoid* any further work around the attachment.

Points to observe

- Make sure the attachments are "cast-on" type.
- Lock the articulated arm and table.
- Do not over wax.
- Avoid wax on attachment working parts.
If this occurs and *remove* the attachment steam clean.
- If in doubt start again.

Although there are many different types of attachments the principles shown above apply to most, if not all intracoronal and extracoronal attachments.

Sprueing, casting and cleaning

As sprueing and casting techniques differ considerably from laboratory to laboratory, the writer lists below only basic principles to be observed.

- On curved span bridgework introduce a burnout rod (approx 1.2 mm) between the last teeth on the bridge to stop the bridge distorting. This will remain in position until completion of the bridgework including ceramics.

- b) Ensure primary and secondary sprues are large enough to prevent porosity.
- c) Use venting feeders to areas under attachments that will be difficult to cast.
- d) Follow the furnace temperature/time settings for the alloy in use.
- e) Do not overheat the casting ring or alloy as both can cause porosity and destroy the physical properties of the alloy.
- f) Devest with care.
- g) Protect the attachments when cleaning the bridge with an airbrasive machine.
- h) Clean attachment areas with a glass brush.

Types of Alloys

Great importance is placed on the type of alloy an attachment is made from as they are fabricated in a variety of alloys all serving different purposes. (See chart "Alloys and Materials for Attachments") The exception to this rule is the use of non-residual combustible plastic (Korak) parts, which can be cast in any dental alloy with a minimum hardness of 260–270 HV and a minimum proof stress of 500 N/mm². However, it is necessary to carefully consider the degree of precision required and wear capability in the design before selecting the alloy, without that knowledge a cast attachment could fail. If there is any doubt always resort to manufactured components. Awareness of the melting point of any part of an attachment requiring soldering is essential to avoid disaster and therefore, because of its importance, will be dealt with separately under the heading "Soldering techniques".

Cendres & Métaux SA Alloys and Materials for Attachments

Alloys and materials for attachments

Symbol/ Name	Colour	Composition							Melting range °C	Hardness condition as delivered HV 5
		Au	Pt	Pd	Ag	Cu	Ir	Other		
		%	%	%	%	%	%	+ = <1%		
C = CERAMICOR	white	60.0	19.0	20.0			1.0		1400–1490	205
H = HMA 20 High Melting Alloy	white		80.0				20.0		1820–1850	210
E = ELITOR	yellow	68.6	2.5	4.0	11.8	10.6	+	Zn 2.5	880– 940	265
EL = ELASTICOR	yellow	61.0	13.5		16.5	9.0			950–1050	260
O = OSV	white	60.0	10.0	8.0		14.0		+ Mn, Ni, Zn	1030–1100	280
A = ALPA	white	35.0	1.0	10.5	41.0	12.0		+ In	880– 960	235
D = DORAL	white	15.0		20.0	49.3	13.7		Ru 2.0	930–1015	210
T = TITANIUM	white							Ti 98.9	1670	225
S = SYNTAX	white							Ti 90.0 Al 6.0 V 4.0	1605–1660	350
X = STEEL	white							Fe 72.0 Cr 18.0 Ni 9.0 Mn, Si		220
I = INS	white	Aluminiumoxide (special quality)								
K = KORAK	white/ transparent	Non-residual burnout plastic for the casting technique								
G = GALAK	different colours	mouth resistant plastic not suitable for casting								

¹ Slow cooling in the cylinder or soldering block

⁶ annealing: 700 °C 10 Min/H₂O
and hardening: 400 °C 15 Min/slow cooling

See also page 7 "CM Casting-on or Soldering" (*)

⁷ annealing: 850 °C 10 Min/H₂O
and hardening: 400 °C 15 Min/slow cooling

² See page 13 "CM Resin-bonding Technique" (*)

⁸ annealing: 800 °C 10 Min/H₂O
and hardening: 400 °C 15 Min/slow cooling

³ See page 12 "CM Spacer Technique" (*)

⁴ See page 11 "CM Plastic" (*)

⁵ Pickling: in a warm solution of 10 vol.% sulfuric acid (H₂SO₄). Do not pickle with nitric acid (HNO₃) or hydrochloric acid (HCl). These acids destroy the alloy. Oxides arising from casting or soldering can also be removed by sandblasting.

(*) Refer to CM catalogue.

Hardness after casting-on or soldering ¹	Hardening HV 5	0.2% Proof stress (Rp 0.2%) condition as delivered N/mm ²	0.2% Proof stress (Rp 0.2%) N/mm ² after casting-on ¹	after soldering ¹ only ¹	with thermal treatment	Metallic connection possibilities	Technical hints, fields of application
205 self-hardening	205	635	635	635		Casting-on or soldering	Non-oxidizing alloy for casting-on with precious metal alloys or for soldering with precious/non-precious metal alloys
210 self-hardening	210	505	505	505		Casting-on or soldering	Non-oxidizing alloy for casting-on or soldering with precious/non-precious metal alloys
> 260 self-hardening	285 ⁶	690		655	740 ⁶	Soldering	Alloy for attachments ⁵
		820					Parts for attachments with high elasticity, for polymerisation
> 300 partially self-hardening	355 ⁷	770		640	900 ⁷	Soldering	Alloy for attachments high strength ⁵
> 250 partially self-hardening	290 ⁶	675		460	720 ⁶	Soldering	Ag-Au-Pd-alloy for attachments ⁵
> 235 partially self-hardening	320 ⁸	685		570	960 ⁸	Soldering	Ag-Pd-Au-alloy for attachments ⁵
		630				Not suitable for casting-on or soldering	Root posts
		925				Not suitable for casting-on or soldering	Root posts, endodontic anchors and attachments
							Auxiliary instruments split spring washer
according to dental alloy used							Ceramic spacer (female molder) for casting with precious or non-precious alloys 0.2% Proof stress (Rp 0.2%) > 500 N/mm ² (see ² and/or ³)
according to dental alloy used							Plastic attachment-parts for casting with precious or non-precious alloys 0.2% Proof stress (Rp 0.2%) > 500 N/mm ² (see ⁴)
							Plastic attachment-parts for polymerisation, plastic sleeves and auxiliary parts

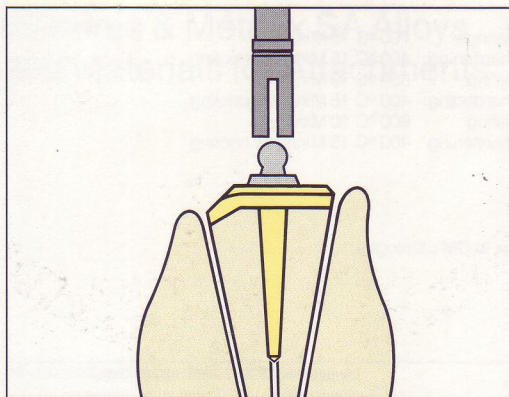


Fig. 41 Paralleled anchor on cast root cap.

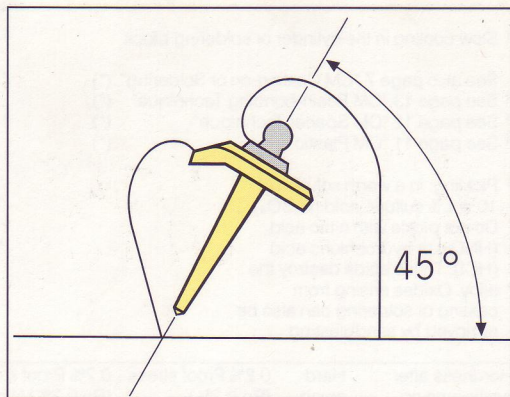


Fig. 42 Invested anchor on root cap.

Open Flame Soldering 1

Prior to investing an attachment, areas needing protection from solder must first be coated with antifix and allowed to dry.

Method

- Using a parallelometer place the anchor on the root cap and secure with non-residual wax. (Fig. 41)
- Invest at approximately 45 degrees exposing 1/3rd of the anchor. (Fig. 42)
- Dry, then preheat to 400 °C/30 min.
- Check melting range of attachment and alloy, selecting an appropriate solder with a melting point 100 °C below the attachment.
- Remove preheated investment model from the furnace and immediately apply a brush flame continually rotating the model.
- Raise the temperature of the model to a dull red. Apply a small quantity of flux to

the solder area using a solder pencil. Apply a small amount of solder and continue heating, finally directing the heat source to the back of the model to draw the solder through.

- Devest, clean with Degussa Neacid pickling agent following with a glass brush.
- Heat treat 400 °C/15 min** in a porcelain furnace to harden the attachment. (Figs. 43–44)

Note

A badly soldered or a dry joint will fail and without heat treatment probably distort.

Soldering Materials

- Soldering investment.
- Pre-heat furnace.
- Soldering block.

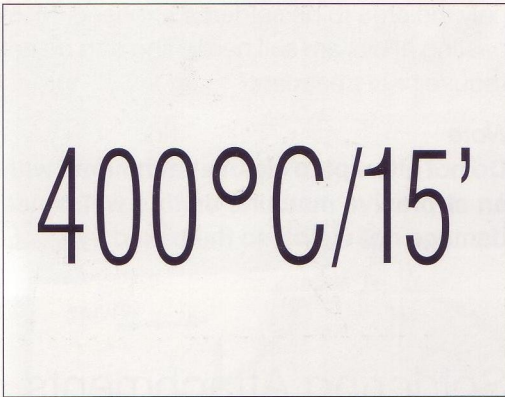


Fig. 43
Heat treat for 15 min at 400 °C in the porcelain furnace.

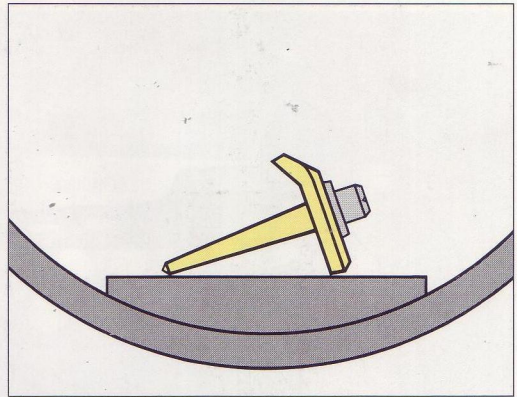


Fig. 44

- 4) Third arm jig.
- 5a) Flux. Porcelain/metal.
(C-Flux)
- b) Flux. Invested/freehand.
(Soldering paste)
- c) Flux. Gold and CoCr.
- 6) Gas/propane, air/oxygen.
- 7) Torch with interchangeable tips.
- 8) Hydroflame microflame gas generator.
See "Hydroflame gas generators".
- 9) Ribbon solder dispenser.
- 10) Pickling agent (Degussa Neacid)
- 11) Anti flux
- 12) Glass fibre brush.

CM Solders

A selection of solders should be kept available, compatible with alloys and attachments used.

Sample selection and use

1. Metal/ceramic.

S.G 1. <Gold>	1080 °C
S.W1. <White>	1080 °C
S.G2. <Gold>	825 °C
S.W2. <White>	825 °C
2. Other gold alloys.

S.G2.	825 °C
S.G3.	740 °C
3. Non precious metals (CoCr)

S.925	925 °C
S.870	870 °C

Soldering is a very precise procedure. An inexperienced technician would be advised to practice before attempting soldering delicate and expensive attachments and will find the use of a solder dispenser a valuable aid. (Materials list item 9)

Points to observe

- a) Use small soldering models.
- b) Preheat to correct temperature and time.
- c) Correct flux.
- d) Solder compatible with alloy.

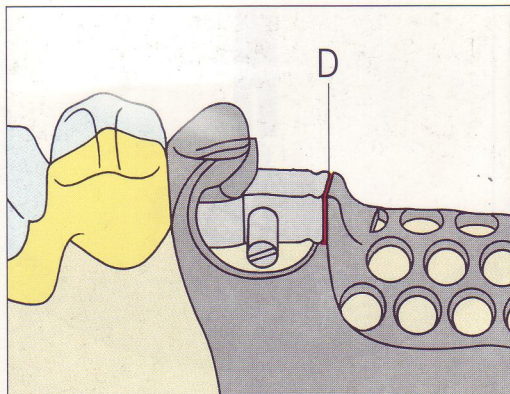


Fig. 45 1. Only solder the end part of the matrix to the chrome frame.

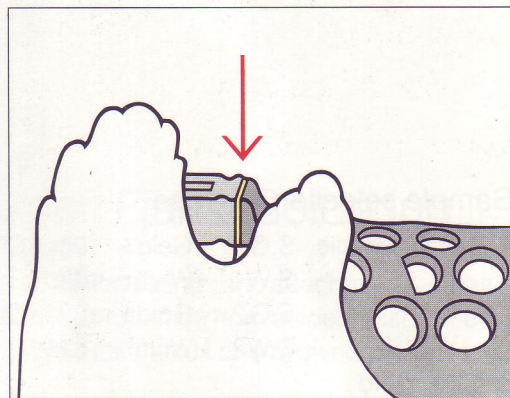


Fig. 46 2. Investment model with CM SG and chrome frame.

Open Flame Soldering Slides and Similar Attachments 2

Follow the directions for "Open flame soldering 1" except items b) and h). Investment models should always be as small as possible and cover all metal work leaving

only the area to be soldered exposed. Most casting alloys are self hardening and do not require heat treatment.

Note

Do not attempt to clean attachments with an airbrasive machine as this will cause damage not visible to the naked eye.

Soldering Attachments to Chrome Cobalt

Example: CM SG Slide

Method

- Align attachment to the chrome frame on the model, secure with Duralay or non residual wax. – Area D (Fig. 45)
- Remove screw, separate from the bridge and carefully remove the plastic friction insert.
- Invest, exposing the area to be soldered. (Fig. 46)
- Allow 35 minutes to set and burnout in a suitable furnace at 350 °C.
- Using a hydroflame gas generator (see under separate heading) solder the joint using the appropriate solder. (see CM Solders)
- Devest, clean, reassemble attachment and confirm proper alignment on the model.

Points to observe

- Minimum space between the chrome frame and matrix for solder.
- Small investment model.
- Minimum solder.
- Ensure solder flows throughout the whole area to be soldered.

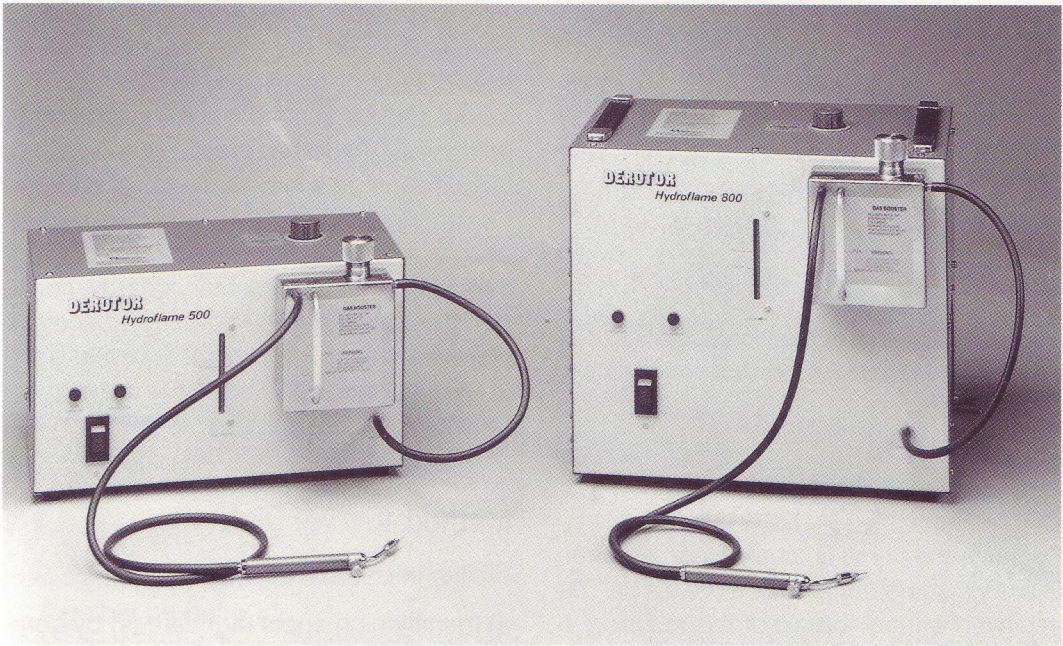


Fig. 47 Hydroflame gas generator.

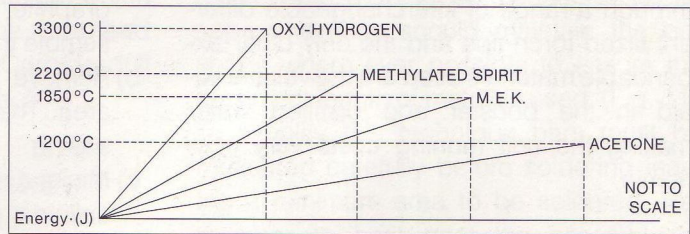


Fig. 48 Volatile liquid/temperature chart.

Hydroflame Gas Generators

A Hydroflame gas generator is probably the most efficient method of soldering attachments to chrome cobalt frames. Due to their versatility they can be used for most micro soldering and micro welding processes in the laboratory. (Fig. 47)

The machines are small, portable and have the ability to generate temperatures up to

approximately 3000 °C depending upon the volatile solution used without the aid of bottled gas. A gas generator uses the principal of electrolysis of water to produce oxygen/hydrogen gas, the characteristics of which can be altered by passing it through a booster unit containing a volatile solution such as acetone, methyl-ethyl-ketone or methylated spirits. Each of these solutions will give a different temperature with methyl-ethyl-ketone providing the best all round temperature for the majority of dental laboratory applications producing temperatures up to 1850 °C. (Fig. 48)

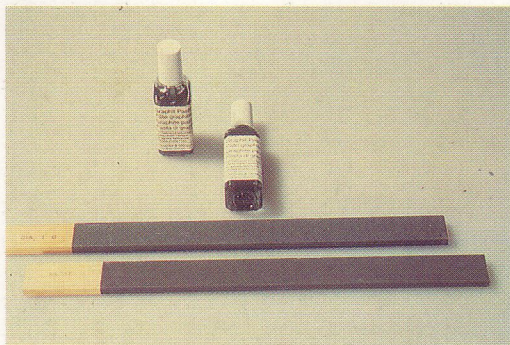


Fig. 49 Emery boards and graphite.

Because the flame is totally clean and free of oxides soldering precious metals can be achieved without the aid of flux resulting in porous free joints. Flame size is adjusted through a range of interchangeable different sized torch tips and the only other expendable materials used are the volatile liquid in the booster and distilled water making the unit running costs very economic.

Note

The above information applies to the Dero-tor hydroflame gas generator and need not apply to other makes.

Information and photograph supplied by kind permission of Quayle Dental Manufacturing Co Ltd. Worthing, West Sussex.

Adjustment and Fitting Attachments

All attachments leaving the Cendres & Métaux SA factory have been adjusted to their correct friction level or retention. How-

ever, laboratory procedures are diverse and varied and there are occasions when they tighten or marginally distort requiring microscopic adjustment after casting-on or soldering. In addition plastic burnout parts invariably need some minor adjustment.

Easing attachments is a very precise operation and must be approached with great care using micro files, emery boards, colloidal graphite (Fig. 49) and burs. To achieve optimum results it is advisable to make adjustments under at least 2.5 x magnifying binoculars or loupes.

Method 1

Slides

- Identify high spots (tight areas) by coating the patrix with an identifying paste or graphite, allow to dry and gently reassemble the slide.
- Remove the patrix and note the shiny area. This is the high spot which needs easing.
- Minimal reduction can be achieved with colloidal graphite by sliding the two sections together until they are free.
- Should the area be large, for example a flat plane, then the use of emery boards and microfiles is essential to retain an even reduction over the whole length of the patrix or matrix, finishing with colloidal graphite to give a smooth finish.

Method 2

Biloc or tubes made in plastic.

It is very rare that a burnout attachment part is cast to perfection. There are many considerations which affect castings such as expansion, microscopic imperfections created in the investment and casting which

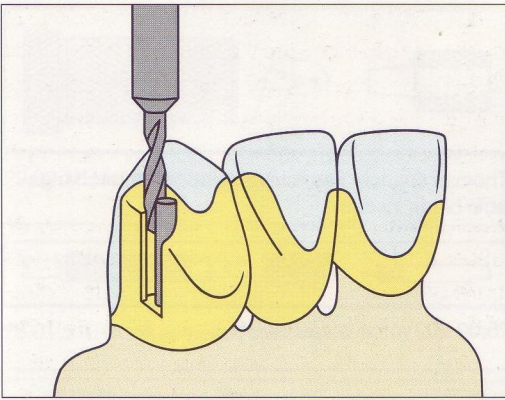


Fig. 50 Biloc matrix with CM drill and guide pin.

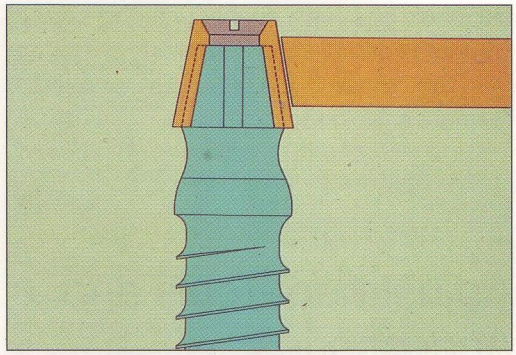


Fig. 51 Gold coping/bar solder joint.

need adjustment before a matrix and patrix fit together properly.

Tube and sleeve type attachments present a special difficulty due to their shape which can only be resolved with a fine rose head bur such as a CM 22.10.36, Carbide drill CM 22.10.37 and graphite. (Fig. 50)

- Follow Method 1a) b) c).
- Use CM carbide bur CM 22.10.3.
- Guide pin CM 22.10.38.
- Finish with graphite.
- Flat planes are corrected with emery boards.

Note

- When using a CM carbide drill which is dimensionally correct care must be taken to avoid irreparable damage.
- Remove only a little at a time.
- Check that the sliding action is smooth.

Method 3

Bars fabricated in either Korak or precious metal.

Following the principals outlined in the section "Adjusting slides" adjustment of bars

can be achieved with emery boards and colloidal graphite.

When soldered joints are used in bar work for example, a Dolder bar connected to root caps, the joints should maintain the bar shape where ever possible to ensure the maximum length of matrix is used. (Fig. 51) To simplify this technique bars must be measured carefully before soldering leaving a minimum area to be soldered. Remember to heat treat the assembly at 400 °C/15 min.

Points to observe

- Use emery board in exactly the correct plane.
- Finish with colloidal graphite.
- Check the degree of friction or passiveness and if necessary repeat the procedure.

Important

When using an emery board always lay the board on a flat surface and lightly work the

bar back and forth evenly until the correct contour is established. Regularly check the fit – remember if too much is removed it cannot be replaced!

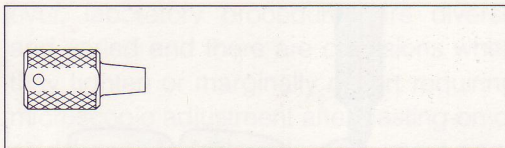
Adjustment Tools and Accessories

All adjustable attachments have specially designed tools for activation, deactivation and screws. All are clearly identified in the CM catalogue and usually ordered with the attachment to be passed on to the surgeon on completion of the case. As some tools are very similar it is essential that the appropriate adjustment tool is sealed in a plastic bag and identified with the CM code and patient's name or, if it is known the surgeon has a suitable tool, then only a CM code number should be recorded both in laboratory and patient's records.

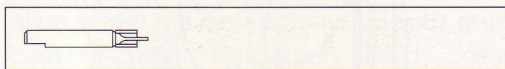
For a complete understanding of the following tools the reader will find it helpful to refer to the CM catalogue and corresponding reference numbers.

CM Screwdrivers

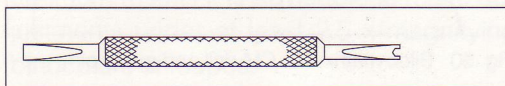
Illustrated below are some of the screwdrivers made by Cendres & Métaux SA. All differ slightly and some can be used on more than one type of attachment but it is important to use the designated driver to avoid damaging the screw head. Also, a set of watchmakers screwdrivers is necessary in the laboratory to complement the CM range, however, these should not be used on CM screws which have parallel slots as the blades are tapered and could damage the head.



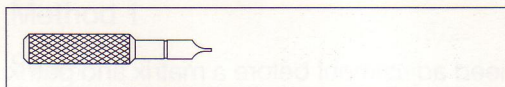
Thomas spanner key is used to accept interchangeable blade inserts.



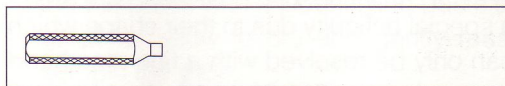
25.02.20 Typical blade insert.



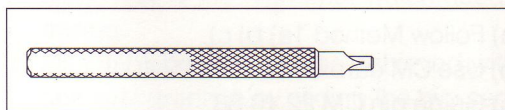
22.04.80 Double ended.



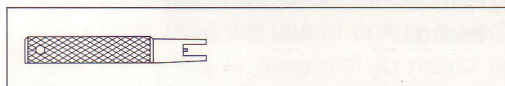
33.01.50 Cap screws.



142.14.236 Buccal and lab screwdriver.



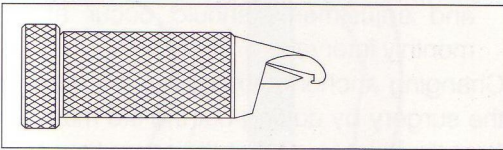
43.01.50 Split ring.



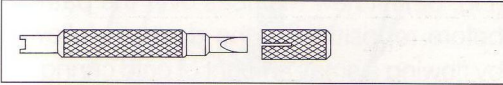
32.02.510 Retention core.

CM Activator/deactivator

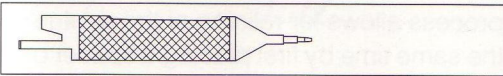
Like screwdrivers there are a large number of adjustment tools from simple blade adjusters to hand screw activators with micro adjustment, some of which are illustrated below.



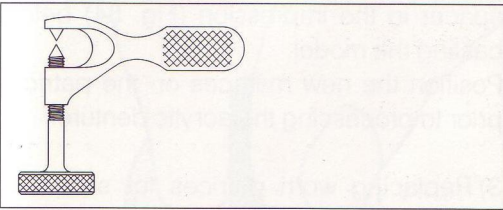
22.03.15 McCollum slide activator.



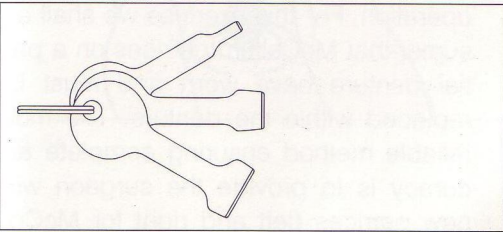
23.01.510 Cone activator/deactivator.



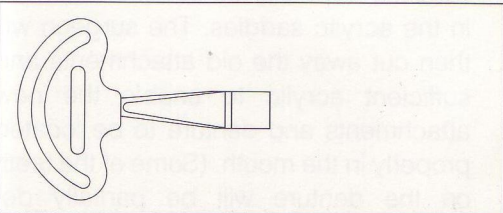
24.01.55 Combi-Snap activator/deactivator.



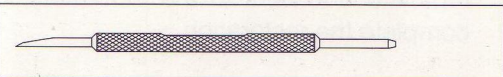
31.01.25 Conod anchor activator.



51.01.25 Dolder activator for 51.01.2 + 5

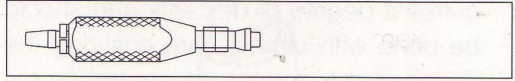


51.01.225 Dolder deactivator for 51.01.2 sleeve.
N.B. Alternative deactivator for 51.01.5

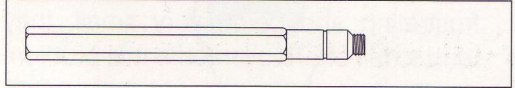


31.07.25 Fäh anchor Activator/deactivator.

Other instruments and tools



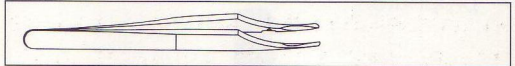
31.02.816 Plastic ring insertion tool for placing ring over anchor matrices to prevent acrylic flowing into attachment.



32.02.515 Heating rod used to remove matrices from an acrylic denture.



32.09.22 Transfer jig used in an impression to support an anchor matrix.



21.01.250 Separating tool for most separable attachments. CM attachment tweezers are an essential part the technicians kit making separation an easy operation.

Assembling and disassembling attachments

Breaking down and reassembling attachments requires care as so many parts are miniscule and can be lost. Besides using the correct tool it is recommended that attachments should be broken down over a clean light coloured surface and all components placed in small containers then identified.

Helpful tips

- 1) To reduce the risk of losing micro studs and springs place each part on a double sided sticky pad placed inside the storage container. Parts are less likely to be misplaced when removing the lid.

- 2) Assembling attachments with springs requires a degree of dexterity and should be done with utmost care ensuring the spring is the correct way round (some are tapered) and both spring and screw are properly seated.
- 3) Holding screws on a screwdriver can be frustrating and being very small, they tend to fall off. To overcome this problem dip the end of the screwdriver in petroleum jelly or silicone grease and place the screw on the driver and position the screw. The converse applies when removing a screw.
- 4) When separating attachments always use CM Attachment Tweezers when appropriate.

Servicing Attachments

Parts wear and need to be replaced from time to time. Some have replaceable friction or spring elements that can be changed in the surgery, others like anchor matrices can be changed in the surgery or laboratory and remaining attachments require laboratory servicing.

- 1) Studs, springs and plastic friction elements for the most part are easily removed and replaced and are usually dealt with in the surgery. There is no specific time lapse between servicing, however, but like the motor car regular servicing is essential and all replaceable parts should be changed annually.
 - 2) Anchor matrices lose their efficiency and should be changed. As most anchors are adjustable, the need for replacement is less frequent. Nevertheless inspection and adjustments should occur at six monthly intervals.
- Changing anchor matrices can be done in the surgery by cutting out the old matrices from the denture and at the same time boring a channel through to the lingual wall. (Fig. 52) Fit new matrices over the patrices before repositioning the denture, followed by flowing a small amount of cold curing acrylic resin into the channel to secure the new matrices. Alternatively, the laboratory process allows for relining of the denture at the same time by first placing a spacer over the patrix (Fig. 53) before taking the impression, then inserting a transfer jig into the spacer in the impression (Fig. 54) before casting the model.
- Position the new matrices on the patrices prior to processing the acrylic denture.
- 3) Replacing worn patrices for slide and hinge attachments is considerably more difficult, but can be done with clinical co-operation. For this exercise we shall assume, that McCollum patrices on a partial denture have worn and must be replaced within the denture. The most reliable method ensuring complete accuracy is to provide the surgeon with new patrices (left and right for McCollum), which have soldered serrated extensions added to be used for retention in the acrylic saddles. The surgeon will then cut away the old attachments and sufficient acrylic to enable the new attachments and denture to be located properly in the mouth. (Some of the teeth on the denture will be partially destroyed). The located attachments and denture are then cold cured together, removed and sent to the laboratory to complete the restoration.

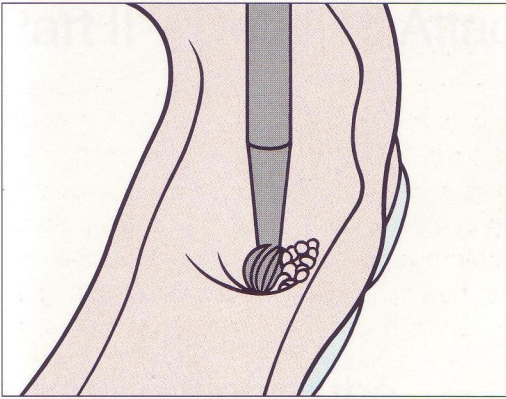


Fig. 52

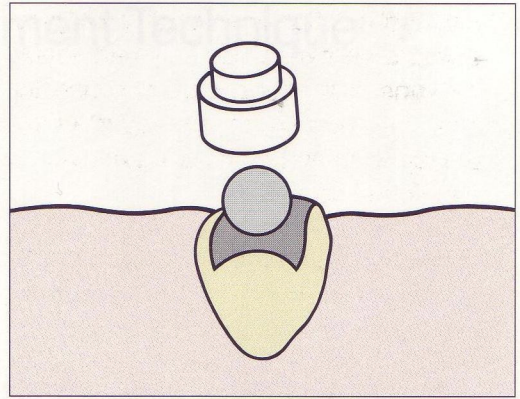


Fig. 53

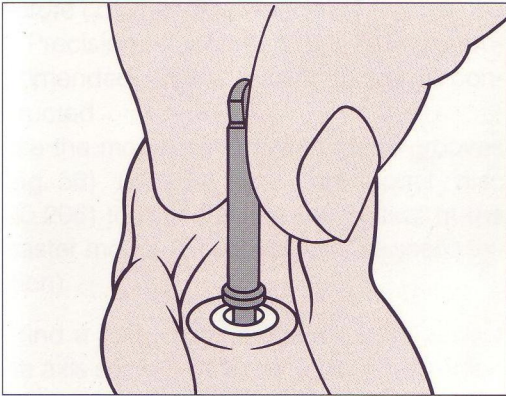


Fig. 54

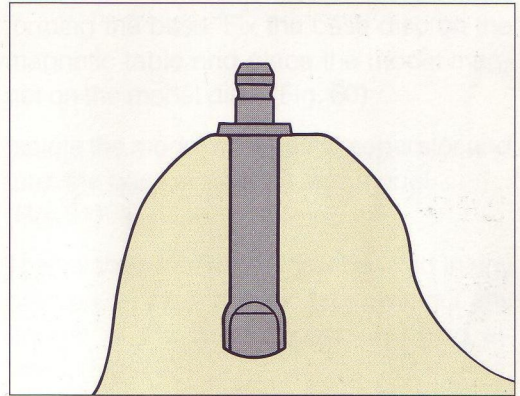


Fig. 55 Model with transfer jig in situ.

Part II – Detailed Attachment Technique

Construction of the master model

Before commencing work involving the use of Precision Attachments, it is strongly recommended, that a master model is constructed.

Use the model pattern with guide grooves (Fig. 56) (80 204) and the model disc (80 206) to manufacture the socket of the master model. (Split cast with magnetic fixation).

Grind a hole in the model base to accept the axis socket. Determine path of insertion on model and fix position on parallelometer/milling unit using the universal joint table (80 195) and a surveying rod (83 320 or 80 363). (Fig. 57)

Fix the parallelometer axis rod (80 364) with the socket (80 365) into the chuck of the parallelometer. Lock all movements of the parallelometer except for the vertical and fill the hole in the model with Duralay or similar material. Gently lower the socket into the Duralay and maintain the position until the resin has completely hardened. (Fig. 58) Carefully open the universal table and remove the model vertically and swing the arm away from the working area.

The predetermined axis of insertion can now be transferred in this manner.

Remove the universal joint table and replace it with the magnetic table. (Fig. 59)

Place a thin plastic foil over the magnetic table to prevent plaster contamination when forming the base. Fix the base disc on the magnetic table and place the model magnet on the model disc. (Fig. 60)

Isolate the model with plaster separator and form the base of the split cast model. (Fig. 61)

The finished model can now be fixed in any position on the magnetic table without any danger of the axis of insertion being altered. (Fig. 62)

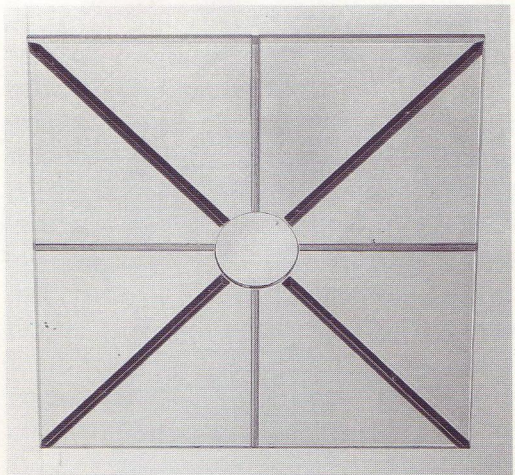


Fig. 56

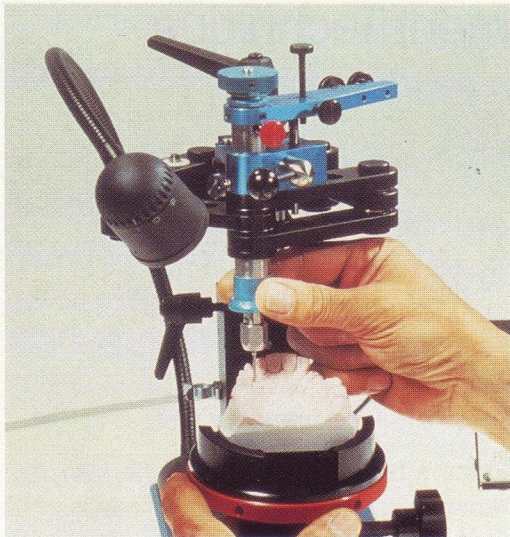


Fig. 57

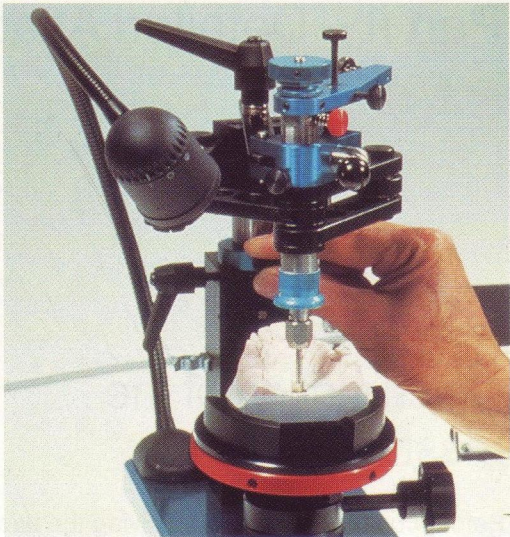


Fig. 58

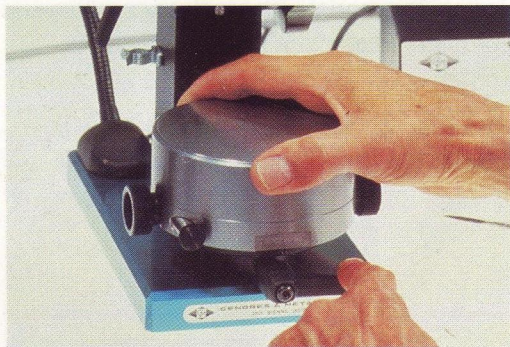


Fig. 59

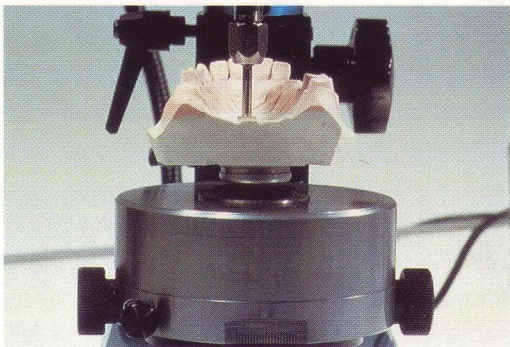


Fig. 60



Fig. 61

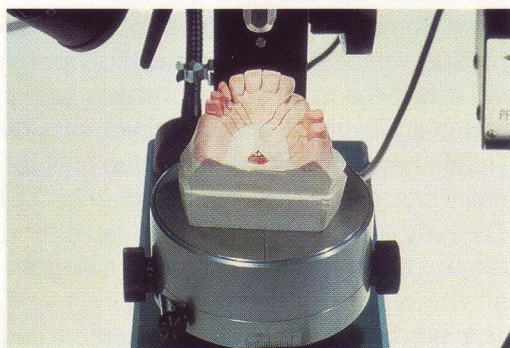


Fig. 62

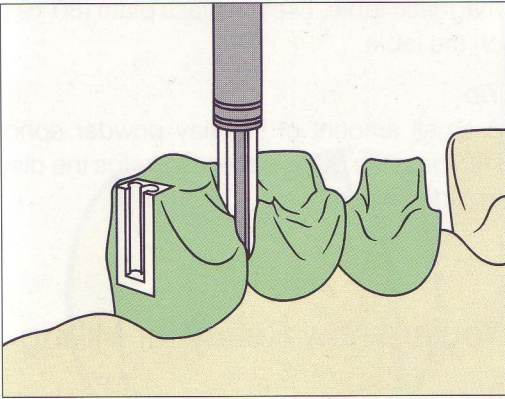


Fig. 63

Guide to Basic Milling Procedures

Before any milling work can be considered a split cast master model must be constructed. (As described in Part II section 1.) Wax-up to full contour in area to be milled. Incorporate any attachments that are to be used including stabilizers for milled bracing arms. (Fig. 63)

Carefully mill wax coping using wax cutters (80 366) to take the main bulk of wax from the surface to be milled. Careful milling here saves time later. Speed – 3000 rpm.

Invest and cast, preferably in an alloy which does not have a high palladium content. (Palladium alloys are very hard and therefore difficult to mill). The alloys which are suitable for milling are mentioned on the CM alloy chart.

Devest and clean casting. Never sandblast where attachments are used as irreparable damage can be caused. Attachments must only be cleaned using steam, in an ultra-

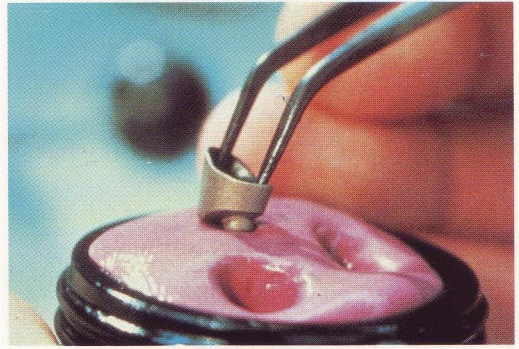


Fig. 64

sonic cleaner and/or with a fibre glass brush (80 305, 80 305)

Using Knetotherm putty (80 851) fabricate a metal milling die. Paint liquid graphite (80 241) inside casting and dry with airline. Push casting into Knetotherm putty (if not available, Formasil will work) to a depth of 1 1/2 cm and shape into a die with undercuts. (Fig. 64)

Melt metal die material (Frässtumpf Metall 80 729) in a pouring spoon over the bunsen (do not overheat), pour into mould and allow to cool (approx 3–4 mins).

Remove metal die together with casting from Knetotherm mould and clean. Replace casting on to model which should be in its original position on the parallelometer/milling unit. Fix transfer instrument (80 577) into the chuck and position over the casting. Gently lower the transfer instrument onto the casting and lock the vertical and horizontal movements of the unit. Fix transfer instrument to the casting with sticky wax or Duralay, allow to harden, and gently lift the casting away vertically and swing the arm

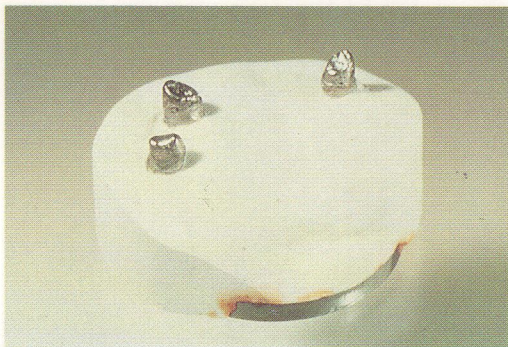


Fig. 65

away from the working surface of the model. Remove the model from the magnetic table. Do not remove the transfer instrument with the casting from the chuck. Place a thin plastic foil over the magnetic table and fix a milling plate (80 208) to the centre of the table. Gently swing the parallelometer arm with the fixed casting back to the centre of the table and put the metal die in position into the casting. Fix the casting to the die with sticky wax.

Mix a small amount of fast setting plaster (Whip-mix mounting stone, Calspar etc) and place onto the milling disc. Gently lower the milling die into the plaster, lock the unit and allow to partially set. Shape the milling model into a dome and allow to harden fully. (Fig. 65)

When set, open the chuck, remove casting from the milling model and clean off all traces of sticky wax and resin residues. Do not use boiling water as this may distort the die.

Check the exact position of the casting on the milling model.

To help with smooth movement of the milling model and to protect the surface of the

magnetic table, use the glass plate (80 194) on the table.

Tip

A small amount of Duralay powder sprinkled onto the glass plate also helps the disc to slide smoothly.

You are now Ready for Milling

Before you undertake any milling work it is worthwhile spending 10 or 15 minutes practising on a brass training stump to familiarise yourself with the cutting strength of the tungsten cutters. We think the easiest way to mill is to lock the vertical and horizontal movements of the unit and move the model against the cutter. This gives you much more control as opposed to locking the model and moving the cutter. Always mill in one direction. Speed – 5000 – 15000 rpm depending on the individual instrument. Do not mill backwards and forwards as this will cause vertical lines and grooves in the milled surface. Take your time when milling, do not try to remove a lot of material in one movement. You cannot put it back.

Always use milling oil (80 235).

Always tighten the cutters in the chuck with the key.

Always keep your finger on top of the casting. The rotary action of the cutter together with its cutting pattern can cause the casting to lift away from the die.

There are two common milling designs.

1. Milled surface should be 1/3 parallel and 2/3 tapered with a shoulder cut freehand around the top with a rose head bur. (Fig. 66) Keep the cervical finishing line lower than any attachment but at least 0.50 mm above the surrounding tissue.

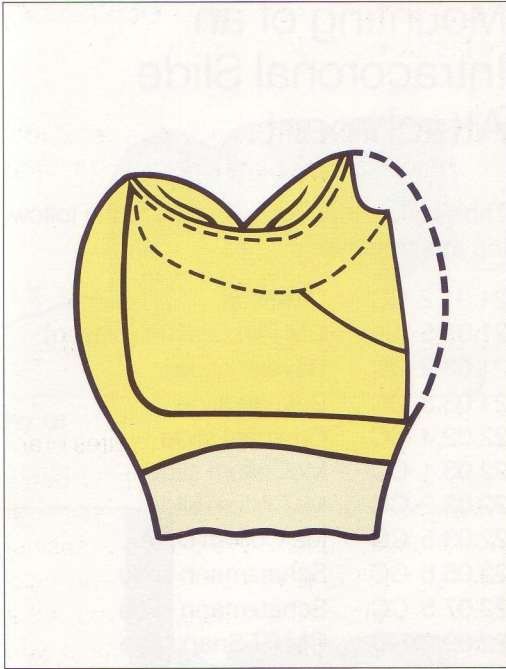


Fig. 66

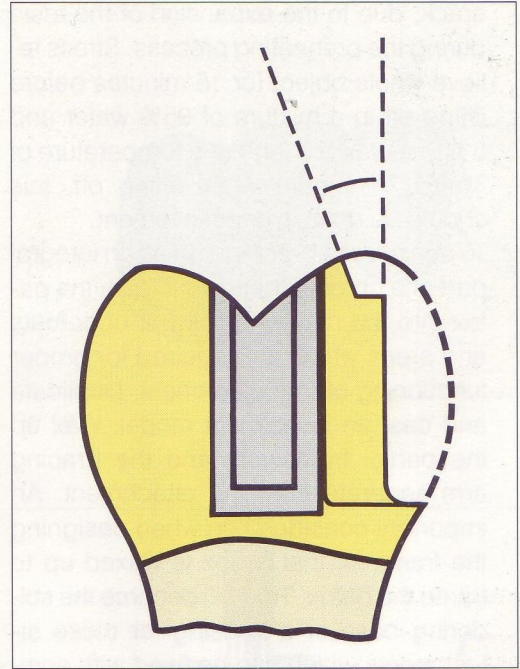


Fig. 67

2. Parallel surface cut with a round ended carbide cutter leaving a rounded shoulder at the base of the crown and a tapered shoulder cut at the top with a 6 degree shoulder cutter (Fig. 67). Finishing line should be just about level with the bottom of any attachment.

Construction of Milled Bracing Arms

(See Part I – “Design of the bracing arm”)

There are two methods of constructing the Milled Brace Support.

1. To construct the milled brace support arm to cast onto the patrix of the attach-

ment in one piece, we recommend the following lift-off technique. Before starting wax-up, make sure any adjustable attachments have been deactivated and the metal surface of the primary part is thoroughly cleaned. Warm the primary part to about 37 °C and apply molten wax in one go. Bredent outer coping wax or Dentaurem Grundler wax is recommended because of its ability to resist distortion. Check for folds or creases inside the wax pattern, as this may cause a bad fit. Products such as Bredent Modelling resin UV or Kulzer Palavit GLC can also be used if you are concerned about possible distortion during the lift off procedure.

When using self curing or light curing resin, the outer surface must be covered in wax. Otherwise the investment may

crack, due to the expansion of the resin during the preheating process. Stress relieve whole object for 15 minutes before lifting off in a mixture of 95% water and 5% Pro-Wax (80 242) at a temperature of 40 °C. Take care when lifting off, this should be done in one movement.

2. To construct a bracing arm as an integral part of a chrome framework reset the patrix into the matrix, block out undercuts and areas which are required for proper functioning of the attachment. Duplicate and cast an investment model. Wax up the partial framework and the bracing arm separate from the attachment. An important consideration when designing the frame is, that a box is waxed up to frame the patrix. This will become the soldering base or a housing for those attachments which can be fixed with composite when the partial frame is finished.

Invest carefully and cast

When cast, clean in the ultrasonic or with a fibre glass brush. Do not sandblast. If secondary part is a very tight fit do not grind inner surface. Paint one part with graphite paste and blow dry with the airline. Adjustment is achieved by inserting and removing the secondary part several times. Clean in the ultrasonic or with steam. The inner surface of the secondary part may be lightly polished with a soft polishing brush and some high polishing paste.

Mounting of an Intracoronal Slide Attachment

These basic instructions apply to the following attachments:

21.01.2 CC	CM Slide
21.01.5 KK	CM Plasta slide (plastic)
21.03.2 CC	Beyeler slide
21.03.3 CC	Beyeler slide
22.02.4 CC	Crismani slide
22.03.1 CC	McCollum slide
22.03.2 CC	McCollum slide
22.03.5 CC	Mc Collum slide
22.05.8 CC	Schatzmann slide
22.07.5 CC	Schatzmann slide
22.09.2 HC	CM PT-Snap slide
22.10.3 KD	CM Biloc slide
22.10.3 KC	CM Biloc slide
24.01.5 CC	CM Combi-Snap screw retained slide

Construct a split cast master model before commencing, as described in Part II section 1.

Wax up abutments etc. to full contour. (Fig. 68) Set up the first tooth of a partial denture and make a silicon key for use as a guide later.

Prepare a box in the distal aspect of the abutment tooth wax up, large enough to accept the matrix of the attachment with space either side. (Fig. 69)

Mark the centre of the jaw ridge. Separate the attachment and degrease the matrix. Fix the paralleling mandrel together with the matrix into the parallelometer.

The matrix should be mounted parallel to the path of insertion, over the centre of the jaw ridge and as close as possible to the preparation. (Fig. 70)

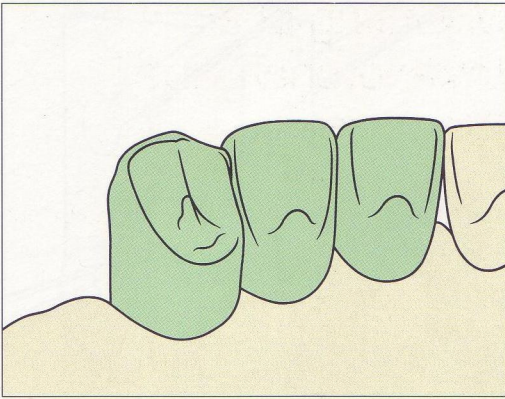


Fig. 68

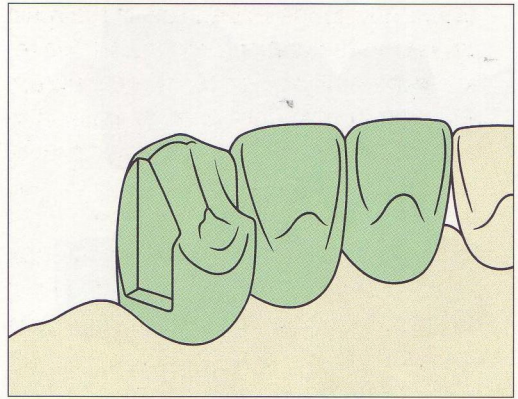


Fig. 69

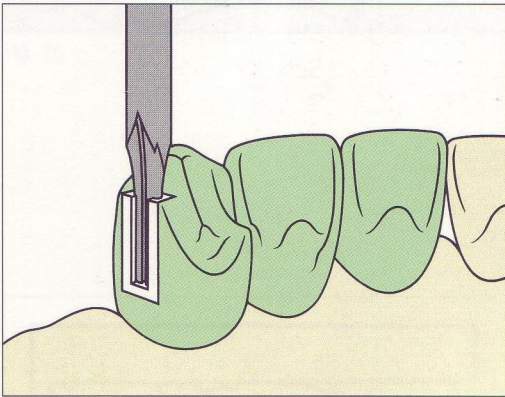


Fig. 70

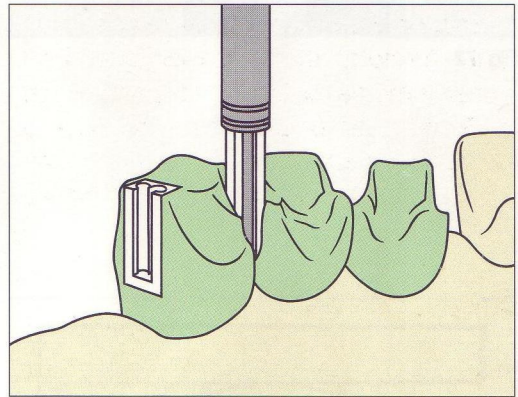


Fig. 71

Note

It is advantageous to avoid any shortening of the attachment to retain maximum surface area for friction.

Mount the matrix in its final position. The matrix should be bounded with wax on 4 sides.

Where necessary, prepare and wax-up for a milled brace support. (Fig. 71) Remove any unnecessary wax and finish to the desired contour.

Replace matrix and check for clearance with the silicone key. With Schatzmann attachments, remove stud spring and screw prior to placing into the matrix.

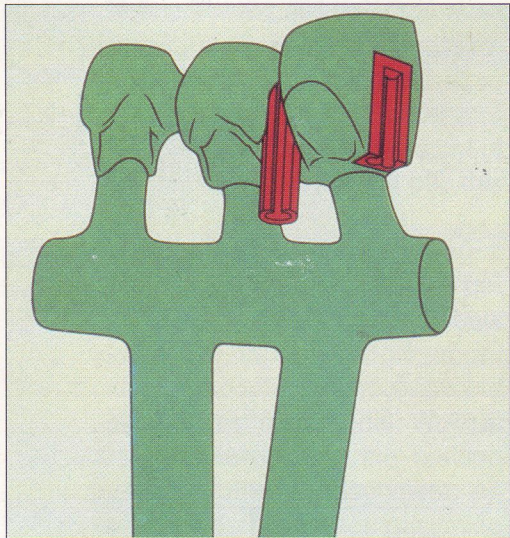


Fig. 72

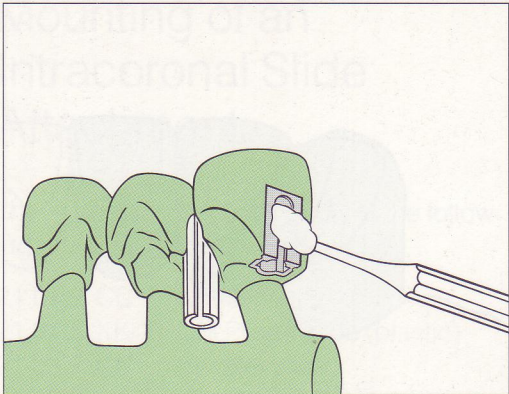


Fig. 73

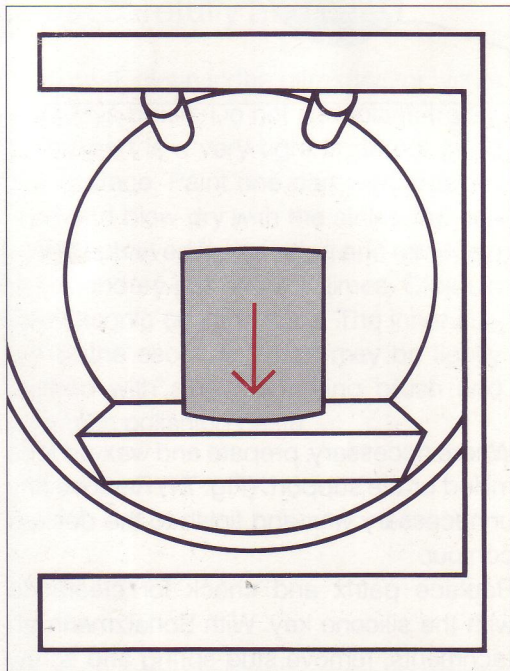


Fig. 74

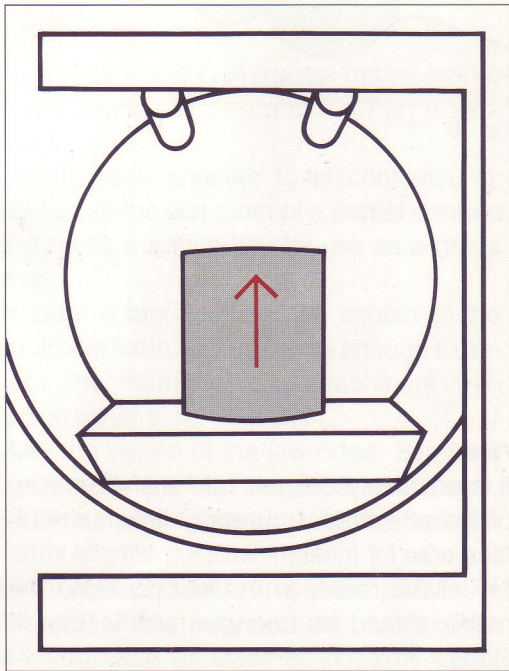


Fig. 75

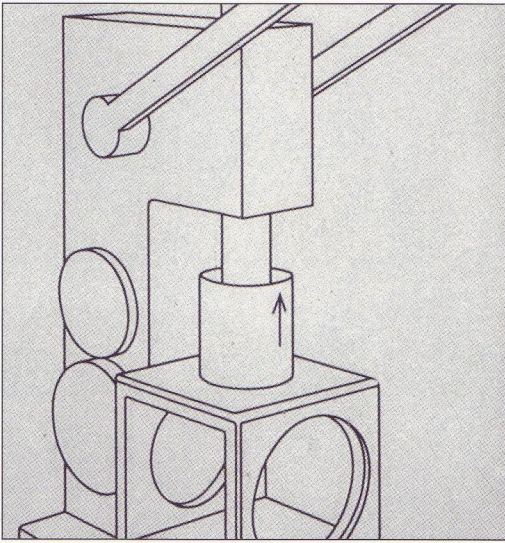


Fig. 76

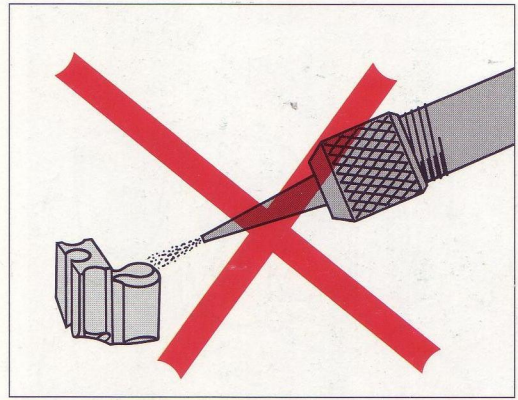


Fig. 77

Attach sprues (Fig. 72) and apply debubbler onto wax surfaces only. Do not apply debubbler to the attachment matrix. Fill up matrix with the appropriate investment using a paint brush or instrument and invest. (Fig. 73)

Allow the investment to completely set

Place the cylinder, with the opening down, into the furnace. (Fig. 74) Raise the temperature to 250 °C for wax elimination.

After 20 minutes, invert the cylinder with the opening up, (Fig. 75) in the furnace (especially important when using plastic attachments).

Slowly raise the temperature to 850 °C. Keep at this temperature, for minimum 1/2 hour depending on ring size, until the sprue hole(s) are the same colour as the furnace walls. Cast at once, and let cylinder cool to room temperature.

Due to differing laboratory techniques and equipment, the times and temperatures shown above are for guidance only and are dependent upon:

- Investment
- Size of ring
- Type of alloy

Remove the investment, preferably with a devesting unit (Fig. 76) and clean with steam, or in the ultrasonic. Do not sandblast an attachment. (Fig. 77)

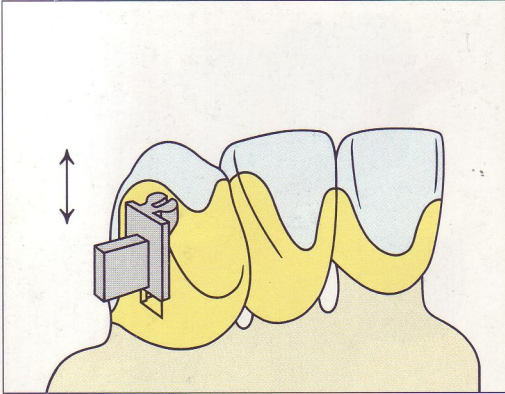


Fig. 78

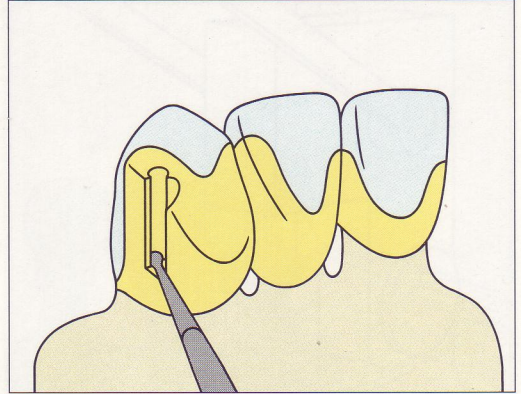


Fig. 79

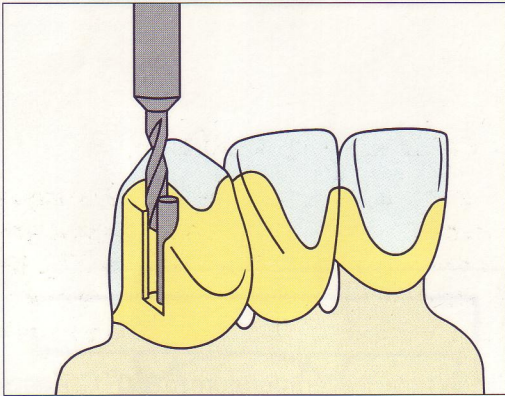


Fig. 80

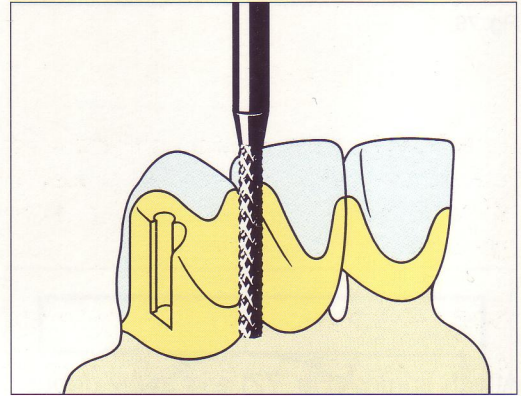


Fig. 81

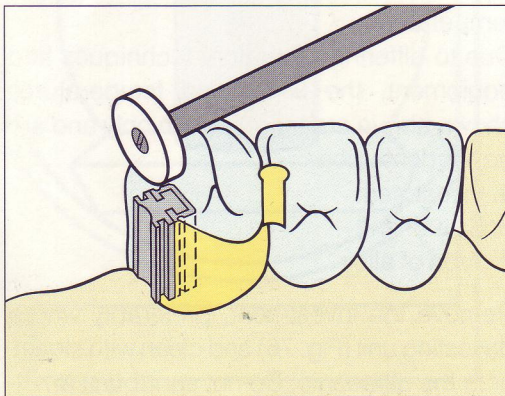


Fig. 82

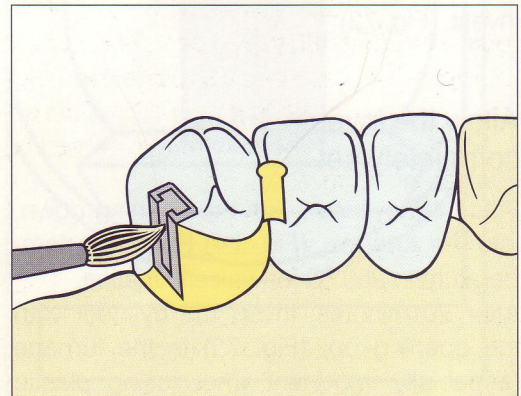


Fig. 83



Fig. 84



Check the function of the attachment by replacing the patrix. If necessary proper fitting is modified by the use of colloidal graphite. (Figs. 78 and 84)

Special notes for Biloc attachments.

Small casting fins or imperfections can be removed with the Biloc drill 22.10.36. (Fig. 79) (See Part I – “Proceedure for waxing in attachments”, Note g)

If necessary calibrate the Biloc cylinders using the 22.10.37 spiral drill and 22.10.38 guide pin. (Fig. 80) (max speed 5000rpm) It is imperative that the guide pin is used during this proceedure to prevent the drill slipping from one cylinder to the other causing irreparable damage.

Finish the milled brace support taking care to avoid the attachment face. (Fig. 81)

Replace the patrix into the matrix and adjust height to the occlusal plane. (Fig. 82)

The patrix should always be placed into the matrix during any trimming or polishing operation.

Porcelain Application

The matrix must always be thoroughly cleaned before each firing. Remove any porcelain particles with a fine brush. (Fig. 83) Subsequent sandblasting to remove porcelain after firing will damage the attachment.

The Cendres & Métaux SA Ceramic Spacer Technique

These instructions apply to the following attachments:

22.10.3 ID	Biloc
22.10.3 IC	Biloc
22.11.5 ID	CM Box

Construct a split cast master model before commencing. (As described in Part II section 1)

Wax up abutments etc. to full contour. (Fig. 84)

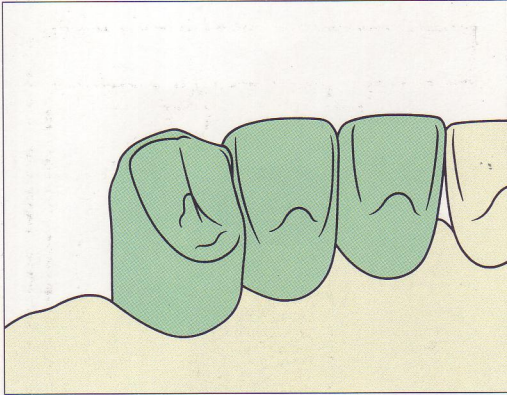


Fig. 84

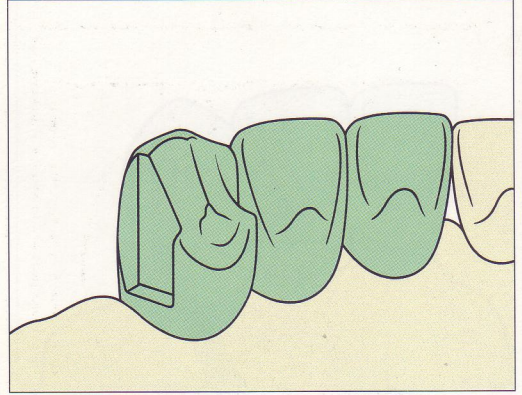


Fig. 85

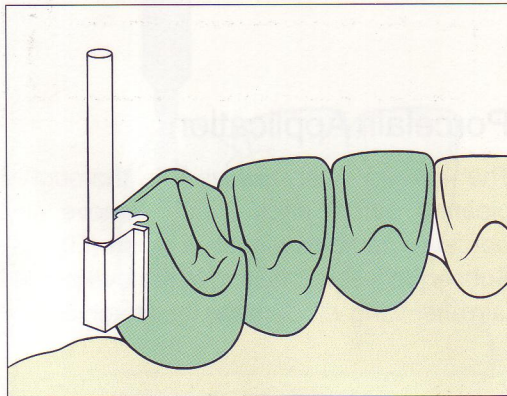


Fig. 86

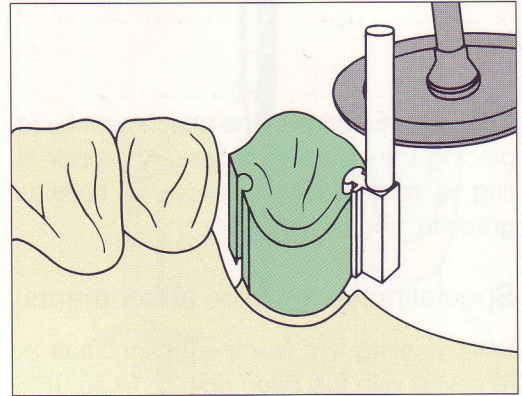


Fig. 87

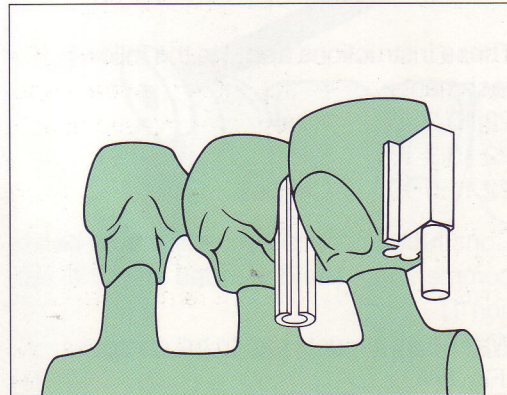


Fig. 88

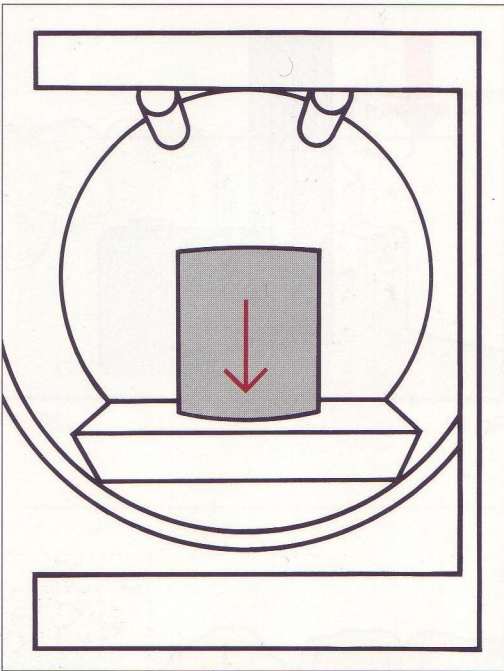


Fig. 89

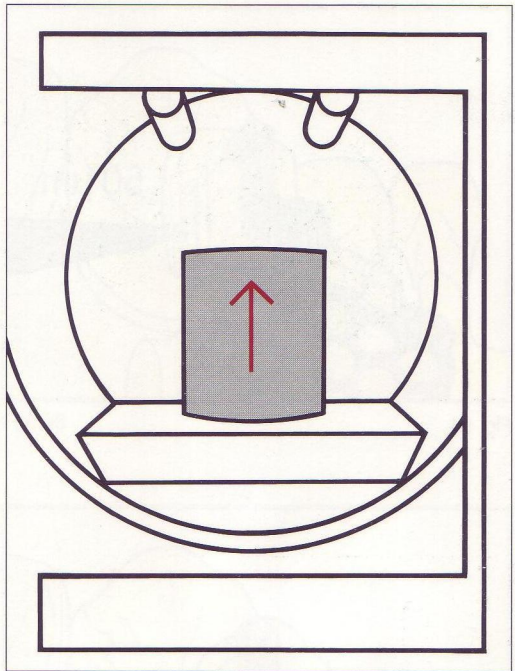


Fig. 90

Prepare a box in the abutment tooth wax-up to accommodate the ceramic spacer. (Fig. 85) Introduce the spacer into the wax-up using the parallelometer. Set into the wax leaving a minimal wall thickness of 0.3 – 0.4 mm. Ensure, that the bottom of the spacer is not resting on the papilla and that it is following the line of the jaw ridge. (Fig. 86) Wax up to the stop plate of the spacer and lift the parallelometer chuck away from the spacer shaft. Prepare wax-up for a milled bracing arm. Remove any unnecessary wax and finish to the desired contour.

Shorten the parallelometer shaft with a double sided diamond disc. (Fig. 87) Attach sprues, apply wetting agent and invest using a fine grained investment. (Fig. 88)

Allow the investment to completely set

Place the cylinder, with the opening down, (Fig. 89) into the furnace. Raise the temperature to 250 °C for wax elimination.

After 20 minutes, invert the cylinder with the opening up, (Fig. 90) in the furnace (especially important when using plastic attachments).

Slowly raise the temperature to 850 °C. Keep at this temperature for minimum 1/2 hour depending on size of ring, until sprue hole(s) are the same colour as the furnace walls.

Due to differing laboratory techniques and equipment, the times and temperatures

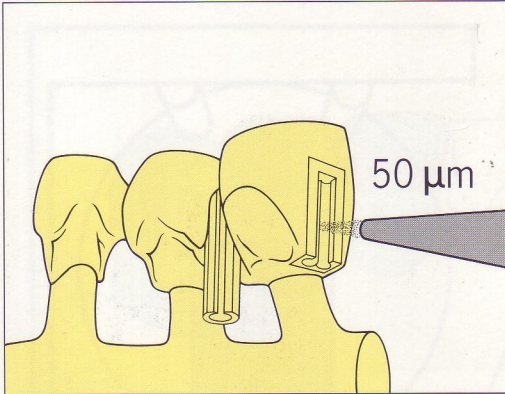


Fig. 91

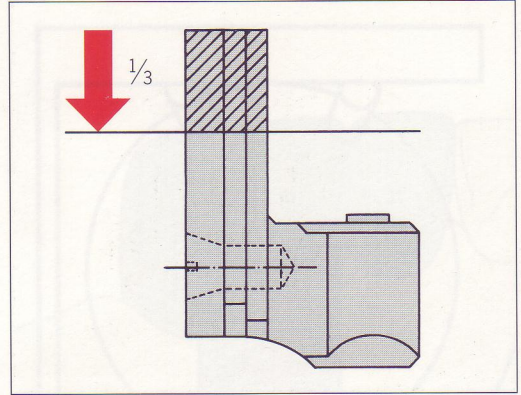


Fig. 92

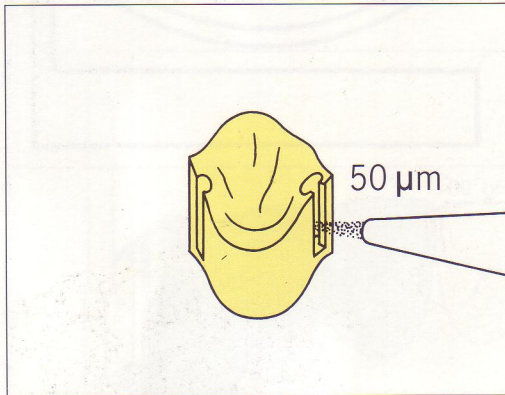


Fig. 93

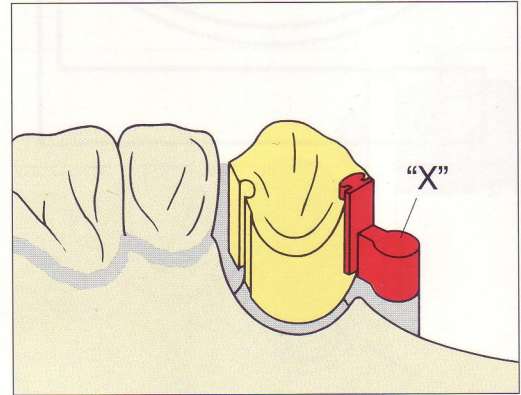


Fig. 94

shown above are for guidance only and are dependent upon:

- a. Investment
- b. Size of ring
- c. Type of alloy

Cast at once in a precious or non precious alloy which has a 0.2% proof stress of minimum 500 N/mm². Bench cool cylinder after casting. Do not quench.

Devest carefully and remove remains of ceramic spacer with 50 micron glass beads. (Fig. 91)

Insert the patrix and trim to the desired height. The CM-Box patrix can be shortened by approximately 2mm, the Biloc patrix 1 mm. (Fig. 92)

The following instructions apply to the CM-Box only

Apply porcelain to the desired stage for try-in. Remove oxides formed during the firing cycle with 50 micron glass beads. (Fig. 93)

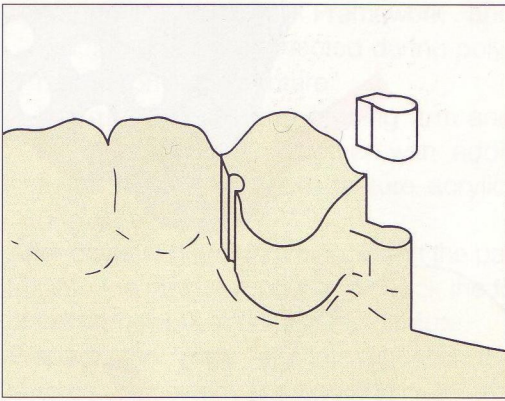


Fig. 95

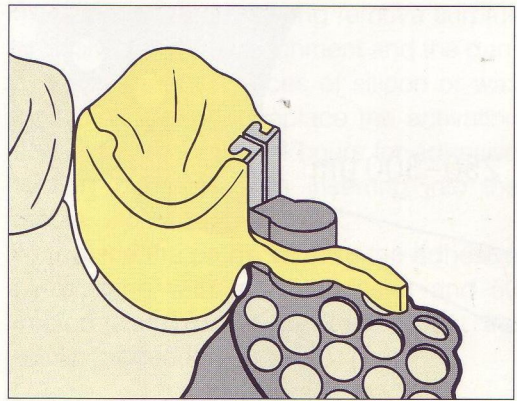


Fig. 96

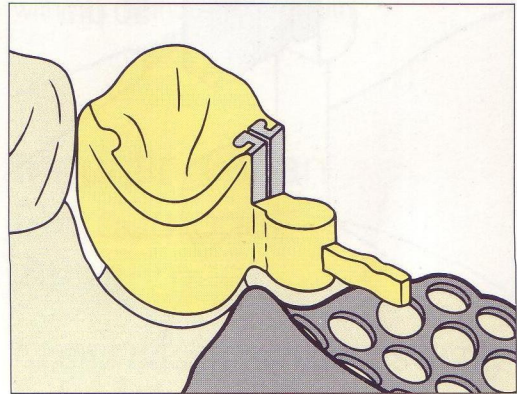


Fig. 97

Try-in and take a new rubber base impression with the crowns/bridgework in place and the patrix removed. Pour impression. When set, remove the impression material and insert the duplicating aid (22.11.525) into the matrix. Block out all undercuts and duplicate. (Fig. 94)

Note

The duplication aid is slightly oversize in the area marked "X" than the actual patrix to provide space for the composite resin fixation which is explained later.

Place the modelling aid (22.11.523) onto the duplicate model (Fig. 95) and incorporate into the chrome wax-up.

It is possible to construct the framework together with the bracing arm in one piece. However, this requires perfect accuracy of the fitting surface which cannot be guaranteed. Therefore the following alternatives are suggested.

1. The modelling aid is cast together with the chrome framework. The bracing arm, together with a suitable retention is made

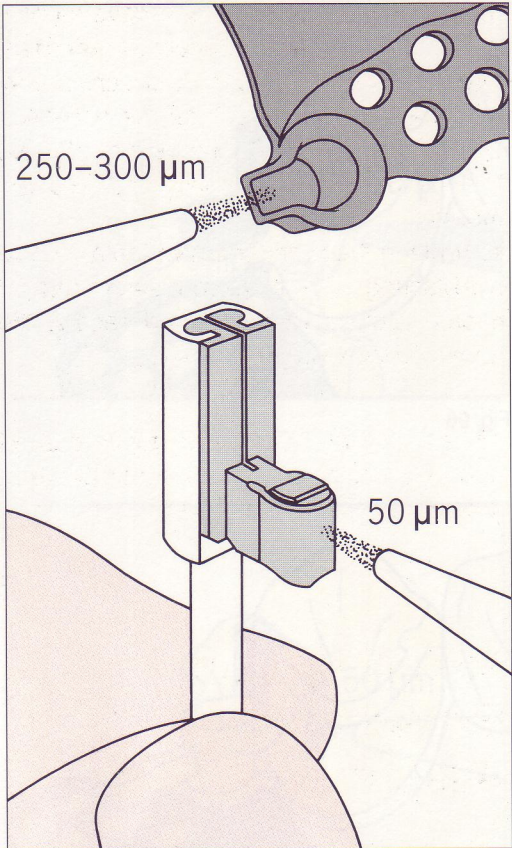


Fig. 98

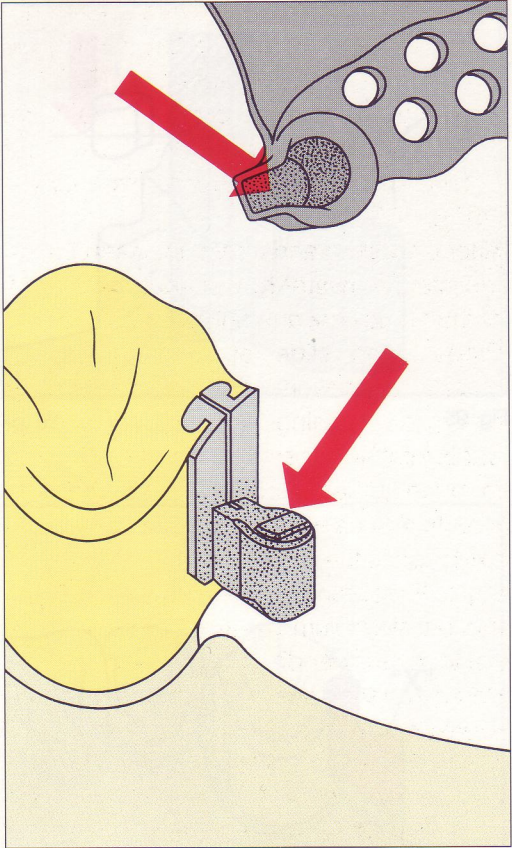


Fig. 99

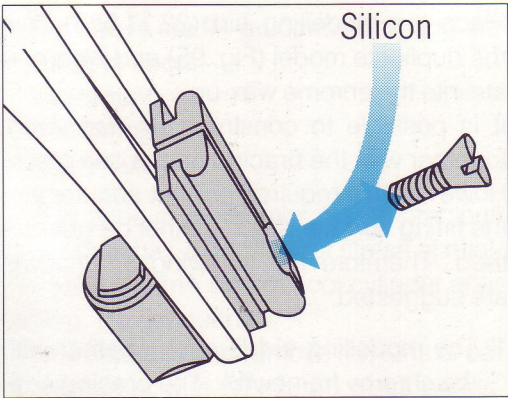


Fig. 100

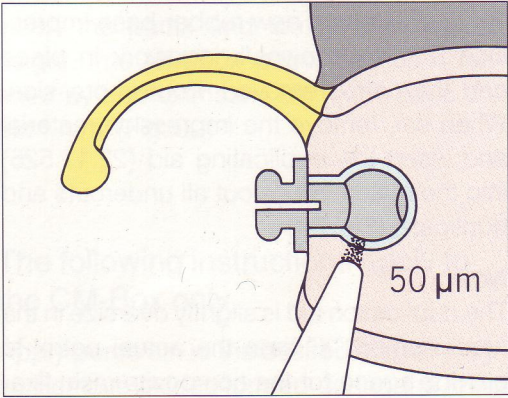


Fig. 101

separately. (Fig. 96) Framework and bracing arm are connected during polymerisation of the denture.

2. Wax-up and cast the bracing arm and the modelling aid together with additional retention for the denture acrylic. (Fig. 97)

After devesting and trimming, insert the patrx into the master model and check the fit of the framework and finish the denture.

Prepare the slide attachment and the chrome framework for bonding with adhesive by cleaning thouroughly. Insert the patrx into the transfer jig (22.11.52) in order to protect the functional parts. Blast the retention area with 50 micron aluminium oxide. Blast the inside of the retention housing of the chrome framework with 250–300 micron aluminium oxide. (Figs. 98–99) Do not touch the sandblasted surfaces.

Remove the patrx with the attachment tweezers from the transfer jig, withdraw the activation screw and fill the activation slot and screw hole with silicon compound or wax. (Fig. 100) Insert the patrx immediately into the matrix. Isolate areas which are not to be in contact with the adhesive with vaseline.

Prepare a sufficient amount of adhesive. Only use adhesives which are suited for bonding attachments. During the development of this attachment the following products were tested successfully.

PANAVIA EX	CAVEX
NIMETIC CEM	ESPE
MICROFILL PONTIC	KULZER

Apply a thin layer of adhesive to the retention part of the attachment patrx and on the inside of the retention housing. Place the completed denture onto the master model and keep in position until the adhesive has set. Where possible hold in position for 1–2 minutes longer than prescribed by the

manufacturer. After setting remove surplus adhesive from the attachment and the denture. Clean off all traces of silicon or wax from the patrx and replace the activation screw. Leave for 12–24 hours for adhesive to fully harden before inserting into the mouth.

To replace the patrx, remove the adhesive by blasting with a micro-blaster and 50 micron aluminium oxide and repeat the above proceedure. (Fig. 101)

Note

All adhesive proceedures must be carried out on a dry model. You cannot proceed with this method in the mouth.

Mounting of an Extracoronral Attachment

These basic instructions apply to the following attachments

23.02.2	CC	Mini-Conex
23.02.5	CC	Conex
23.03.2	CC	Mini-Conex
23.03.5	CC	Conex
23.06.2	DK	Mini-SG Slide
23.06.2	DC	Mini-SG Slide
23.06.2	KK	Plastic Mini-SG Slide
23.06.5	DC	SG Slide
23.06.5	DK	SG Slide
23.08.2	CC	Regulex
25.02.2	CC	Flecher
25.03.5	CC	Screw Conex
25.08.2	CC	Screw Regulex
63.05.2	EC	Dalbo S
63.05.2	DK	Dalbo S
83.01.2	EC	Mini-Dalbo

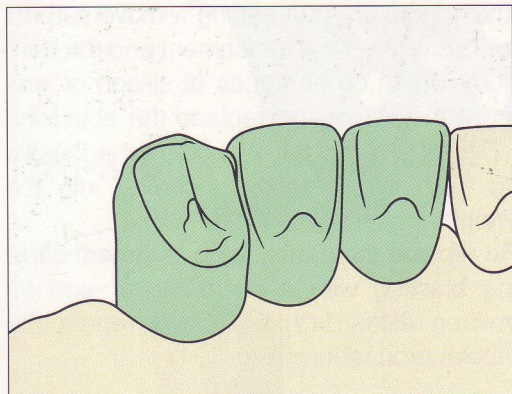


Fig. 102

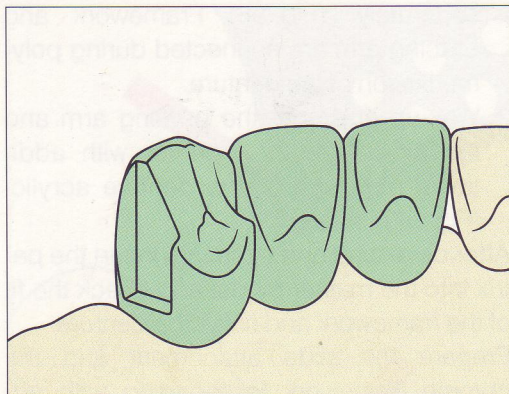


Fig. 103

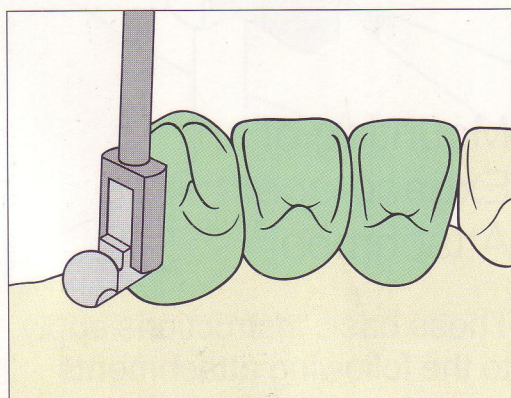


Fig. 104

83.01.2 DK	Mini-Dalbo
83.02.5 CC	Roach
83.02.5 EC	Roach
83.03.5 DK	Plastic Roach

Construct a split cast master model before commencing. (As described in Part II section 1)

Wax up abutments etc. to full contour. (Fig. 102) Set up the first tooth of a partial denture and make a silicon key for use as a guide later.

Mark the middle of the jaw ridge and prepare a box to mount the stop plate of the attachment into the wax up. (Fig. 103) Separate the attachment, degrease the male part, fit into the mandrel and fix into the parallelometer chuck. For a rigid prosthesis, the attachment should be mounted parallel to the direction of insertion in line with the centre of the ridge. Pay attention to the vertical as well as the sagittal plane.

For a resilient prosthesis, to ensure the hinge action of Dalbo, Mini-Dalbo, Roach

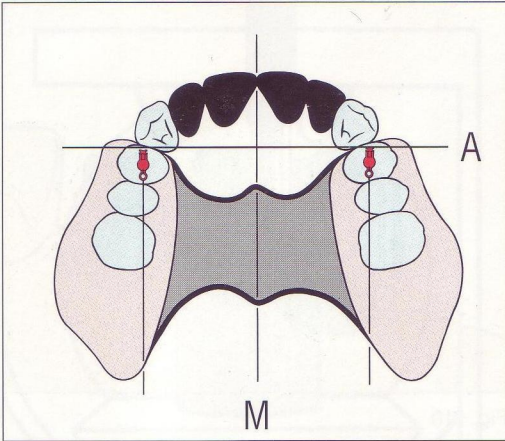


Fig. 105 A – Across the arch

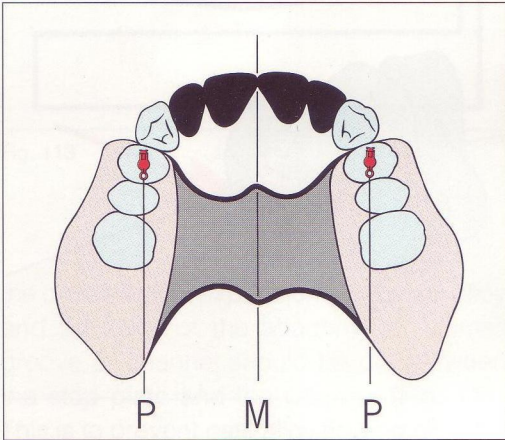


Fig. 107 P – Parallel to the Mid Line

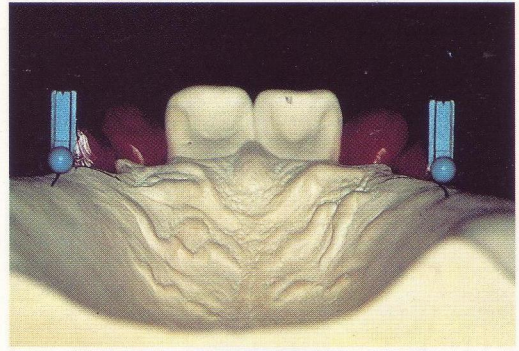


Fig. 106 H – Horizontal

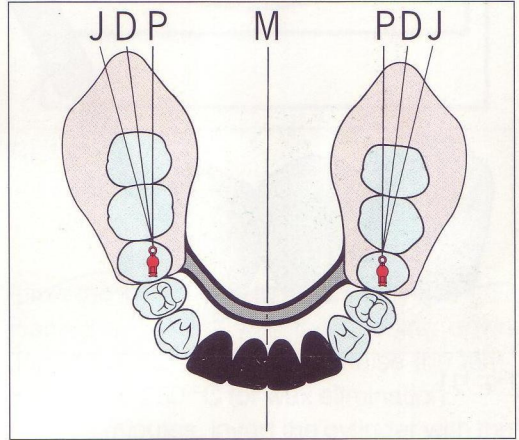


Fig. 108

and Plastic Roach attachments functions correctly the following points must be observed.

The patrix must be mounted correctly in 3 dimensions (Fig. 108)

Across the Arch (A) at right angles to the Mid Line (M)

Horizontal (H)

Parallel (P) to the Mid Line (L)

(Figs. 105–107)

On a lower case observe Fig. 108 where possible. However, if you find that the attachment encroaches into the lingual surface of the denture, it can be mounted on a Disecting Line between the Jaw Ridge and the Mid Line (M).

Note

The angle from the Mid Line to the disecting line should not exceed 6 Degrees.

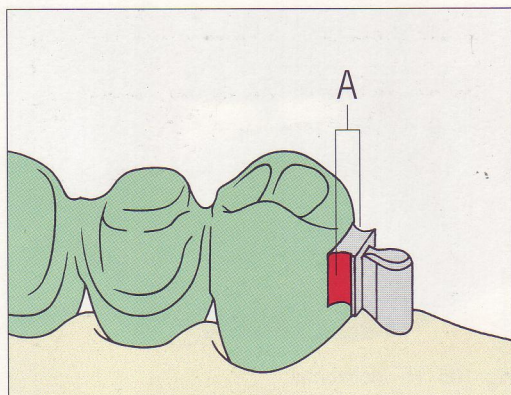


Fig. 109

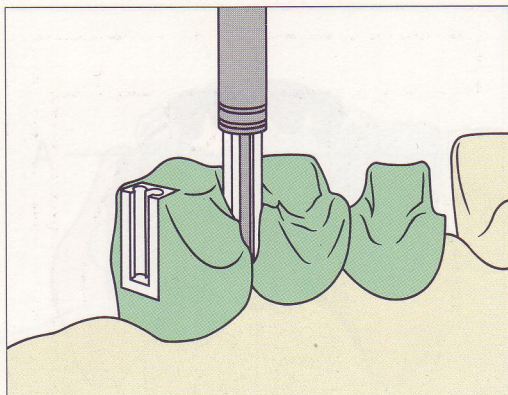


Fig. 110

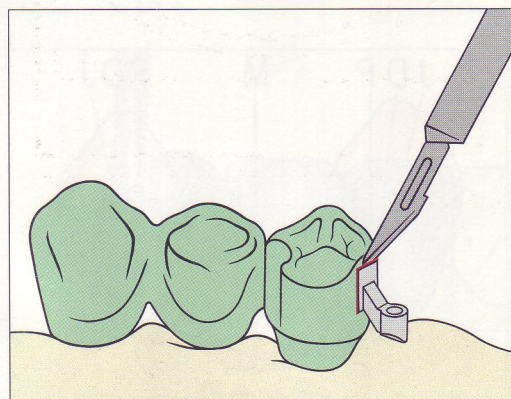


Fig. 111

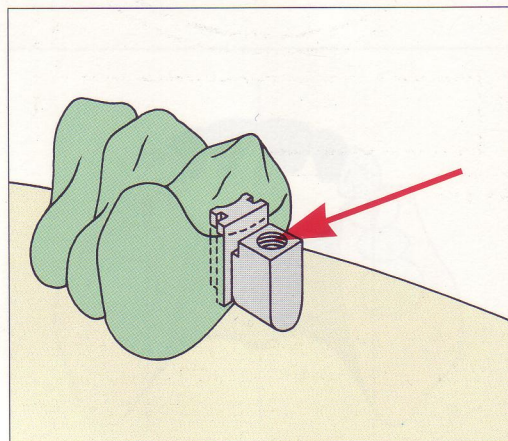


Fig. 112

Replace matrix (after removing any cones, screws etc.) and check clearance with the silicon key.

Ensure that the marginal wax up is not over-contoured. Proper oral hygiene should always be possible. Take this into account when mounting this type of attachment. The distance between the ridge and the attachment should not be less than 1 mm. This will prevent tissue irritation caused by food entrapment and/or plaque build up.

With 23.06 SG attachments make sure that the guiding grooves of the male part (A) are free of wax. (Fig. 109)

Where required, prepare and wax up for a milled brace support. (Fig. 110) Bracing supports should not be used with resilient or hinge attachments. Remove any unnecessary wax and finish to the desired contour.

If the abutment crowns are to be full porcelain crowns, ensure that the stop plate is entirely framed with cast alloy. Pay attention to

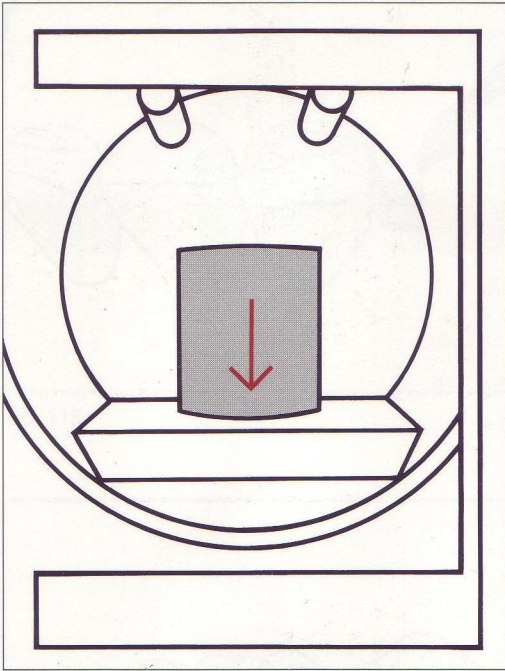


Fig. 113

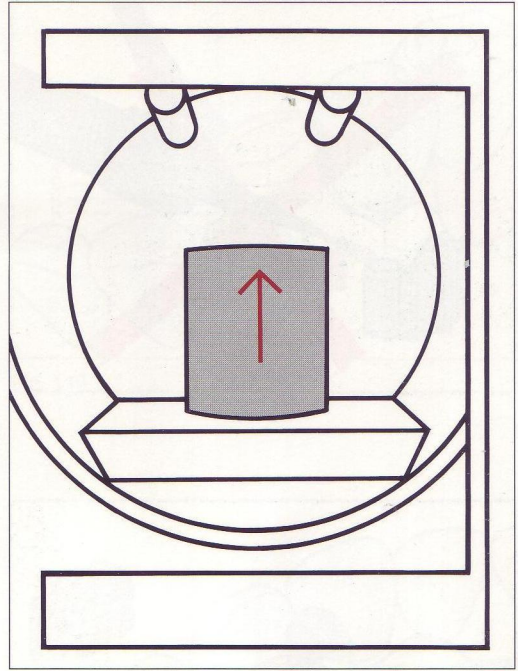


Fig. 114

the coefficient of expansion of the cast alloy and the alloy of the attachment. A small groove or channel should be cut between the stop plate and the wax up. (Fig. 111) This is to prevent cast alloy flowing onto the friction surface of the male part of the attachment. Also, do not use any stress relieving agent on the attachment otherwise a film of cast alloy may form on the attachment surface. (See Part I – “Procedure for waxing in attachments”)

Prior to investing, remove all screws, adjustable cones etc. With Regulex and Flecher attachments we advise you to paint a small amount of colloidal graphite or anti-flux into the threaded part as a precaution. (Fig. 112)

Invest carefully using a paint brush or small instrument to ensure that there are no voids in and around the attachment.

Allow the investment to completely set. Place the cylinder with the opening down (Fig. 113) into the furnace. Raise the temperature to 250 °C for wax elimination. After 20 minutes, invert the cylinder with the opening up (Fig. 114) in the furnace (especially important when using plastic attachments).

Slowly raise the temperature to the final temperature. Keep at this temperature for minimum 1/2 hour depending on the size of ring, until sprue hole(s) are the same colour as the furnace walls.

Due to differing laboratory techniques and equipment, the times and temperatures shown above are for guidance only and are dependent upon:

- Investment
- Ring size
- Type of alloy

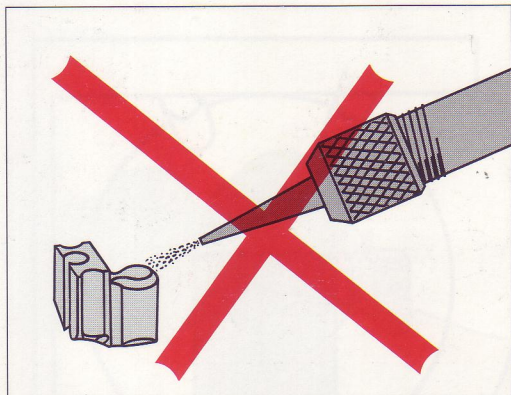


Fig. 115

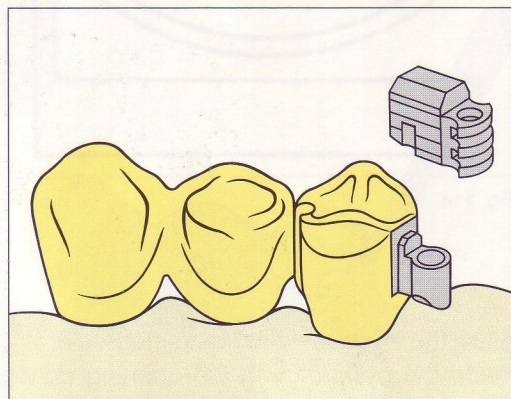


Fig. 116

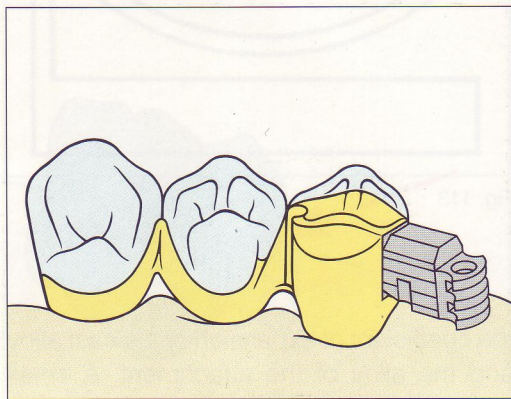


Fig. 117

Cast at once, and let cylinder cool to room temperature.

Remove the investment, preferably with a devesting unit and clean with steam, or in the ultrasonic. *Do not sandblast an attachment.* (Fig. 115)

Check the functions of the attachment such as vertical, hinging or rotational move-

ments. If necessary proper fitting is modified by the use of colloidal graphite. It is applied to only one part and blow dried with air. The adjustment is achieved by inserting and removing the parts several times. Clean off graphite in the ultrasonic cleaner. The matrix should be mounted on the patrix during trimming or polishing to avoid any damage to the patrix. (Figs. 116–117)

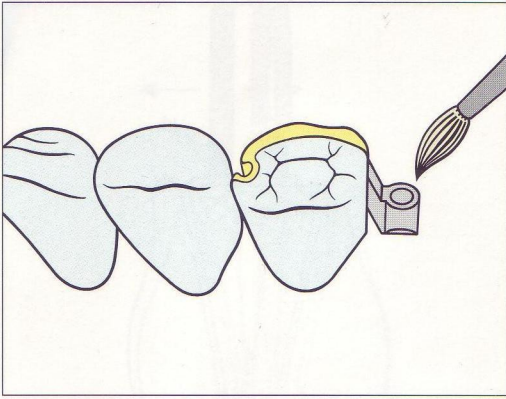


Fig. 118

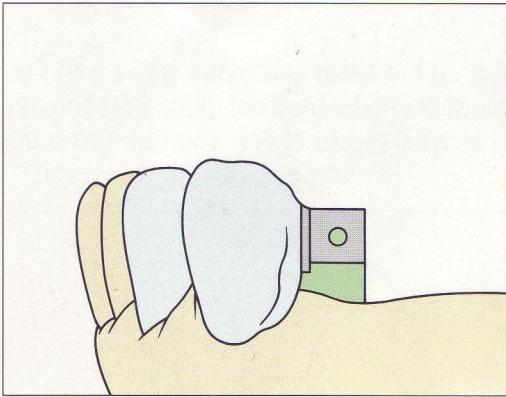


Fig. 120

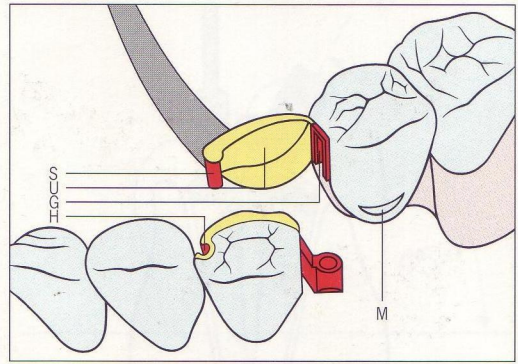


Fig. 119

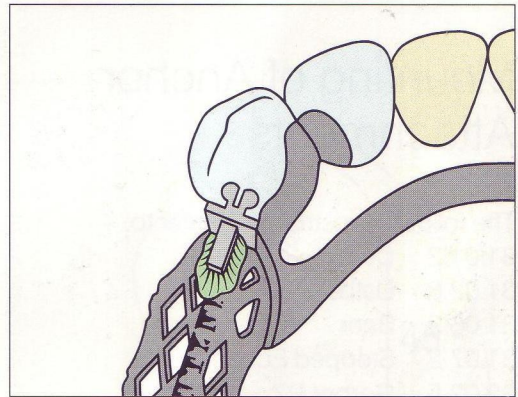


Fig. 121

Porcelain should be built up with the matrix removed. The matrix has to be thoroughly cleaned before each firing. Remove any porcelain particles with a fine brush. (Fig. 118) Finish the milled brace support secondary part. We suggest, that with extracoronary attachments, that the first tooth of a partial denture should be designed as a pontic. This is for three reasons. Hygiene, aesthe-

tics and a ready made thumb nail latch (M) for ease of removal. (Fig. 119)

Solder, spot weld or polymerise the matrix to the partial framework. Make sure all movable parts such as screws, cones, springs etc. are removed. Do not solder an attachment that is designed for polymerisation. Block out all areas which are required for proper functioning. (Figs. 120-121)

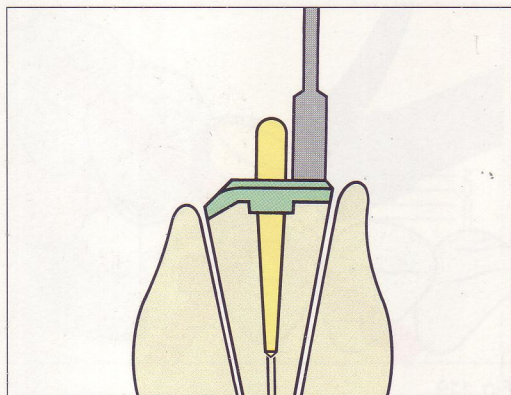


Fig. 122

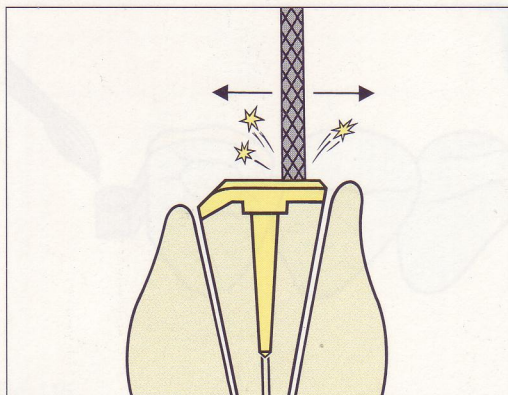


Fig. 123

Mounting of Anchor Attachments

The following instructions refer to:

- 31.01.2 Conod
- 31.02.8 Dalbo-Z
- 31.06.2 Baer
- 31.07.2 Stepped Eccenter
- 32.02.5 Gerber RZ
- 32.07.4 Mini Gerber
- 32.09.2 Micro-Fix
- 33.01.5 Schubiger
- 41.02.8 Dalbo-Z
- 43.02.8 Dalbo-B

For 31.01.5/6 and 41.01.5/6 Rothermann –
See end of this section.

Construct a split cast master model before commencing. (As described in Part II section 1)

Wax up root cap to obtain a horizontal plane at right angles to the path of insertion.

(Fig. 122)

After casting and fitting, mill the root cap at right angles to the path of insertion.

(Fig. 123)

Set up the teeth and make a key with Formasil or similar material. (Fig. 124) The key is to be used to check and determine the

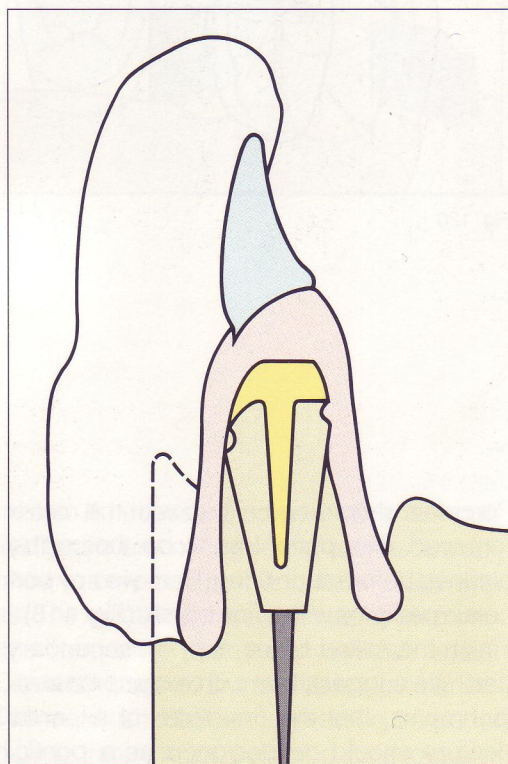


Fig. 124

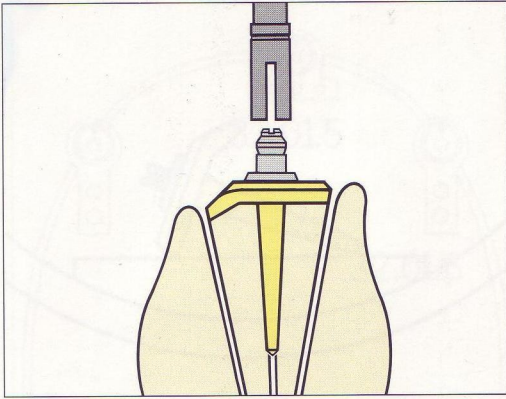


Fig. 125

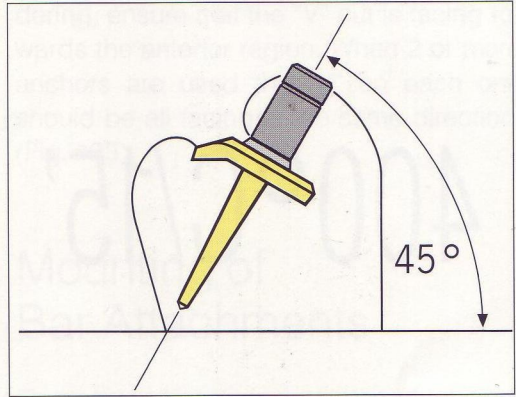


Fig. 126

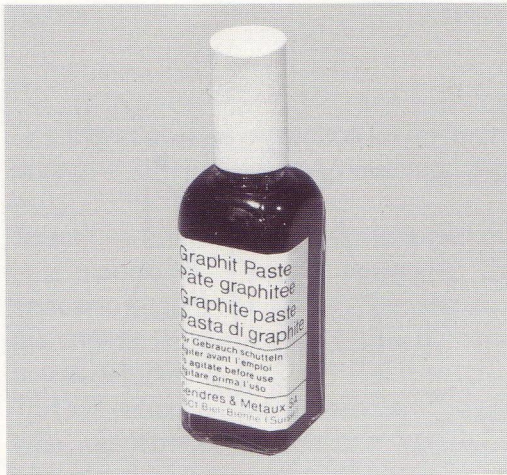


Fig. 127

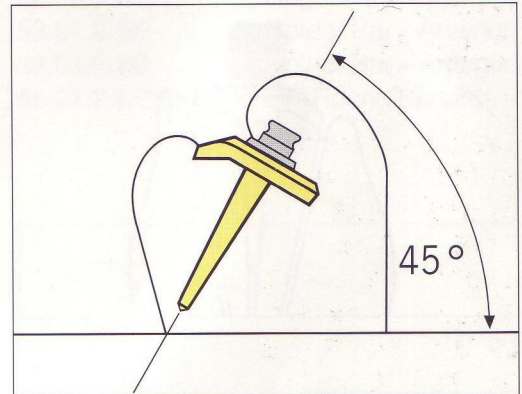


Fig. 128

position of the attachment matrix prior to soldering. The matrix should always, where possible, be positioned in the centre of the tooth.

Place the matrix, using the correct parallelizing mandrel, onto the root cap and fix with wax. (Fig. 125)

Check position and clearance with the key. Remove root cap and matrix ready for soldering. With the Gerber RZ 32.02.5 and the Schubiger screwblock 33.01.5, paint a small amount of colloidal graphite onto the

threaded part of the soldering base and attach the soldering core.

Paint the root cap carefully with the soldering investment mix, being sure to fill in all grooves and angles. (Figs. 126–127)

The root cap should be sited into the investment at an angle of 45 degrees to the working surface. (Fig. 128) Use a glass or metal plate under the investment to avoid possible changes to the powder-water ratio.

(See Part I – “Open flame soldering”).

The soldering block should be as small as

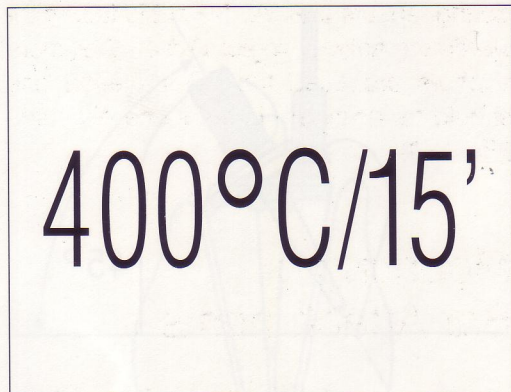


Fig. 129
Heat treat for 15 mins at 400 °C in the Porcelan furnace

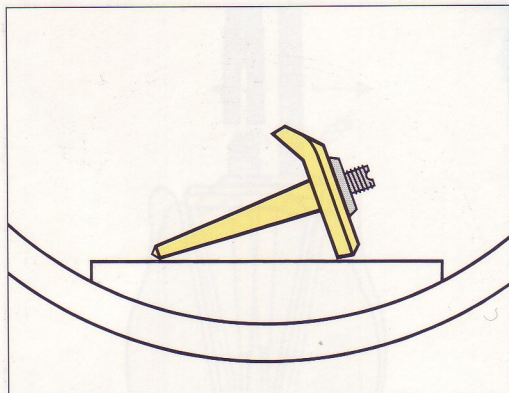


Fig. 130

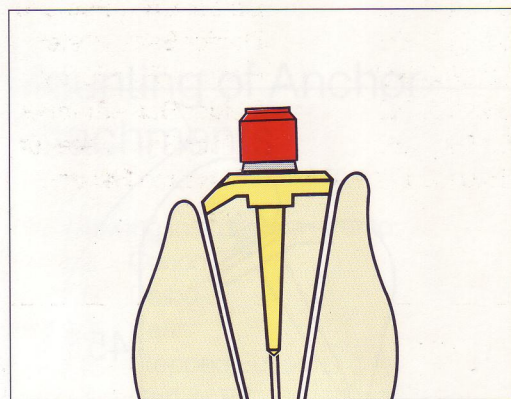


Fig. 131

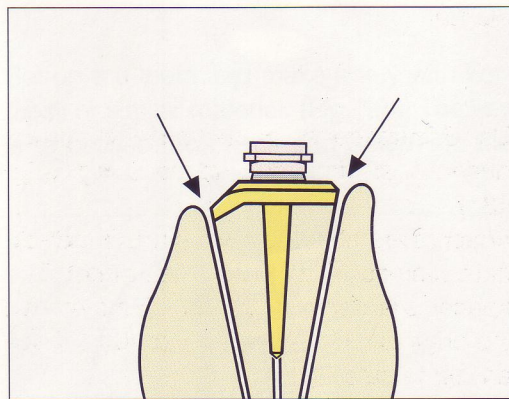


Fig. 132

possible. It is easier to reach the working temperature and to control the soldering process.

After soldering is completed, bench cool.

When cool and before polishing, harden the attachment and root cap at 400 °C for 15 minutes in the porcelain furnace, and bench cool. (Figs. 129–130)

Pickling

Pickle the root cap after soldering and hardening to remove surface oxydation. Dilute sulphuric acid is preferred. The acid (not

the root cap) should be hot for rapid and effective cleaning.

Note

If metallic tweezers are used or in contact with the root cap while it is immersed in the acid, base metal can be easily precipitated by electrolytic action onto the surface causing contamination.

A fibre glass brush may also be helpful to remove oxides.

With all anchor attachments listed above, we supply, where possible, a plastic spacer.

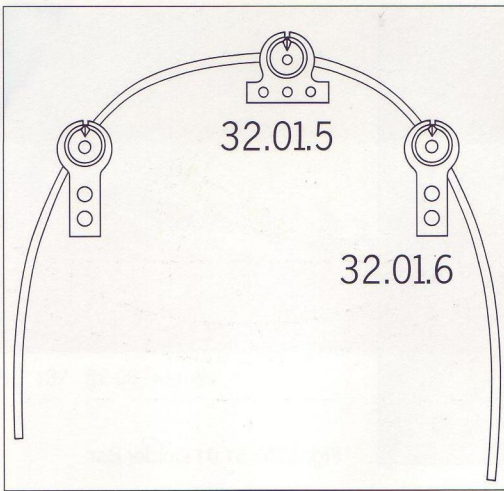


Fig. 133

Use this spacer as protection for the patrix during final trimming and polishing. (Fig. 131)

Spacers are also used when making duplicate models for chrome frameworks. The spacer is larger in height and diameter than the original female part and does not have any undercuts.

This will enhance the construction of basket type retentions in the chrome framework and guarantees an even thickness of acrylic resin surrounding the female part during polymerization.

The Mini Gerber 32.07.4 is designed to be resin-bonded into the chrome framework.

Plastic spacers may also be used as a temporary friction attachment.

Chamfer the edge of the root cap to an angle of 45 degrees, above the gingiva papilla. This helps with proper oral hygiene. (Fig. 132)

32.01.5/6 and 41.01.5/6 Rothermann anchors do not have to be exactly parallel to the path of insertion and therefore do not have a paralleling mandrel.

When attaching to the root cap prior to sol-

dering, ensure that the "V" cut is facing towards the anterior region. When 2 or more anchors are used the "V" on each one should be all facing in the same direction. (Fig. 133)

Mounting of Bar Attachments

These basic instructions apply to the following attachments:

51.01.2 EE	Dolder Bar – Posterior
51.01.5 EE	Dolder Bar – Posterior
52.08.3 KC	Regulex Plastic Bar
53.01.2 EE	Dolder Bar – Anterior
53.01.5 EE	Dolder Bar – Anterior
55.01.2 EO or PR3	CM Round Bar and Rider

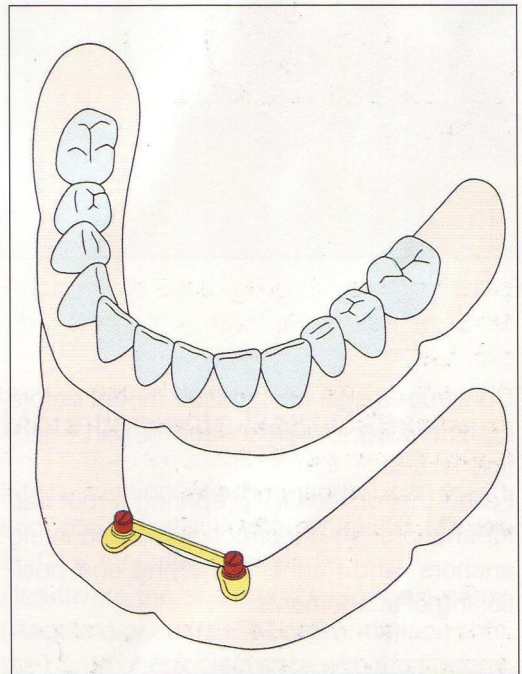


Fig. 134

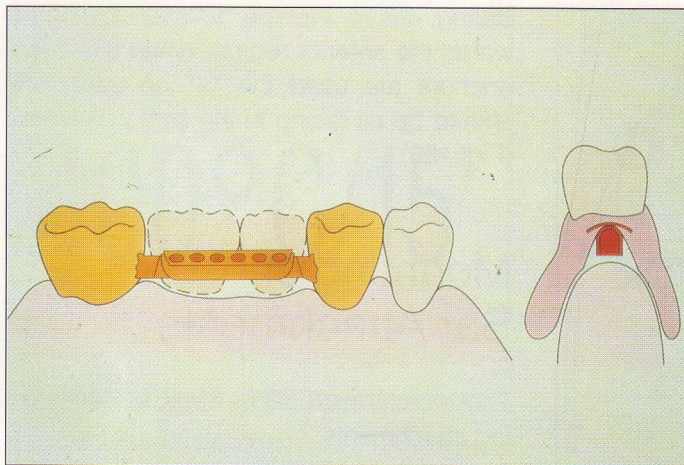


Fig. 135 51.01 Dolder Bar

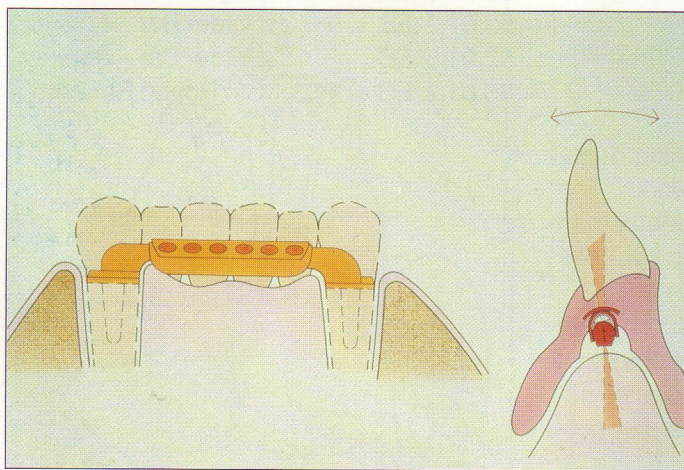


Fig. 136 53.01 Dolder Bar Joint

Construct a split cast master model before commencing. (As described in Part I section 1)

Follow instructions for preparing a root cap for anchors. See "Instructions for mounting anchors" and Part 1 "Surveying and positioning of attachments".

Important Notes

Once this stage has been completed and if the root canals are parallel you may proceed. If not, you must consider the further use of one or more attachments such as the Schubiger Screwblock 33.01.5 to construct a removable bar section. (Fig. 134) If this is your choice, follow the complete instructions for mounting an anchor attachment.

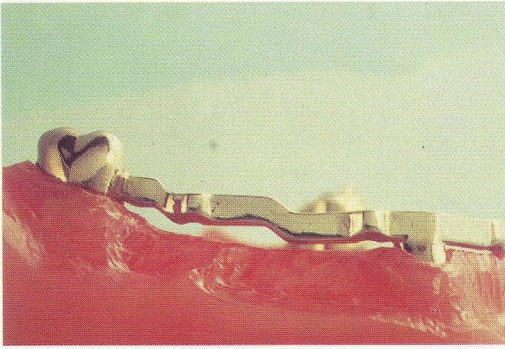


Fig. 137 52.08 Regulex

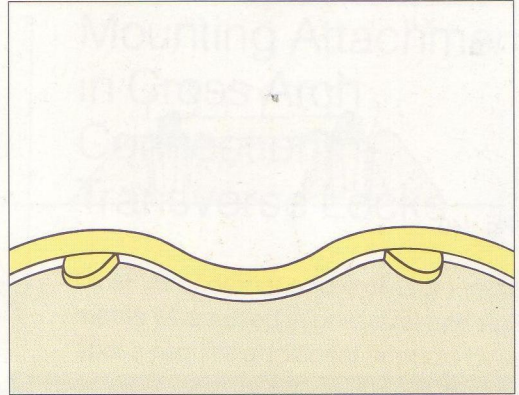


Fig. 138 55.01 CM Bar

Dolder Bars

51.01 and 53.01 may only be used in straight sections and should never be curved or mounted at an angle. (Figs. 135–136) However, they can be edge contoured to overcome irregularities in the ridge shape and level of the root caps. Edge bending a heavy duty bar is achieved by measuring the bar, allowing an excess to accommodate the bends, followed by cutting a “V” shape approximately 2/3rds deep out of the bar at the bend (on the fitting surface side) and then adjusting the bar to the correct contour. Ensure the bar will lay flat on a glass plate before investing and soldering the closed “V” cuts and finally heat treating. (See part 1 – “Open flame soldering”)

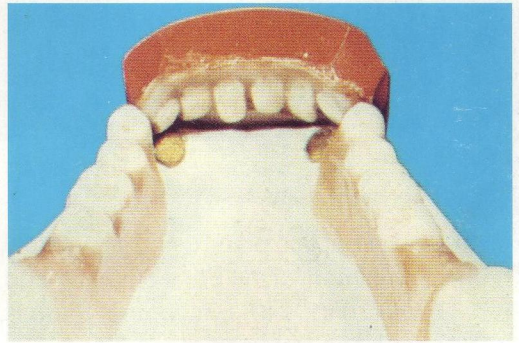


Fig. 139

Regulex Bars

52.08 may be subdivided, stepped or curved. (Fig. 137)

CM Bar

55.01 may be bent and curved to follow the contours of the ridge. (Fig. 138)

Mounting onto Root Caps

Fit bar section into the mandrel and insert into the parallelometer chuck. CM Bar 55.01 is mounted free hand.

Deactivate the channel (Dolder bar) patrix (Regulex) or riders (CM bar) and place onto the bar to check clearance with the silicone key. (Fig. 139)

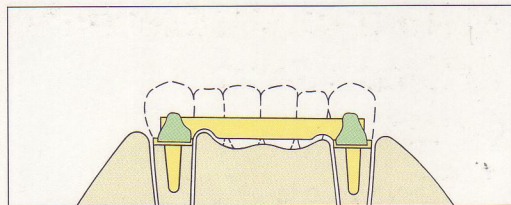


Fig. 140

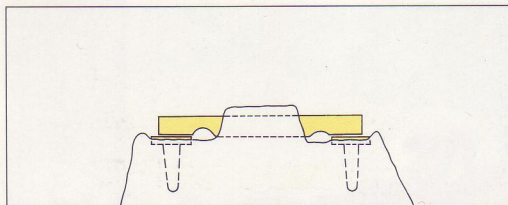


Fig. 141

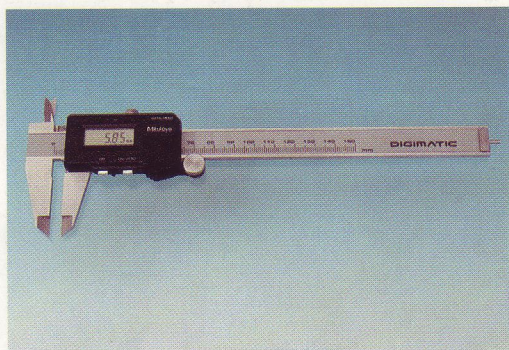


Fig. 142

Gently lower bar into place using the vertical height adjustment of the parallelometer and fix with wax. (Fig. 140) Ensure that there is sufficient space between the underside of the bar and the tissue for hygiene purposes. Remove the channel, patrices or riders and ensure the bar is attached securely with Duralay to the root cap.

When completely set, remove complete assembly for investing. (Fig. 141)

Root Caps with Schubiger Anchors or Implant Cases

Using an internal measuring device, (Fig. 142) measure accurately the space between the abutments before attempting to cut the bar to size. Accuracy is very important

at this stage as too large a gap between the bar and the attachment or implant collar could pull the abutments together during the soldering process causing stress.

Fit bar section into the mandrel and insert into the parallelometer chuck. CM Bar 55.01 is mounted free hand.

Gently lower bar into place using the vertical height adjustment of the parallelometer and fix with wax. Ensure that there is sufficient space between the underside of the bar and the tissue for hygiene purposes.

Deactivate the channel (Dolder bar), patrix (Regulex) or riders (CM bar) and place onto the bar to check clearance with the silicone key.

Remove the channel, patrices or riders and ensure the bar is attached securely with Duralay to the attachment or implant collar.

Remove screws from the attachments or im-

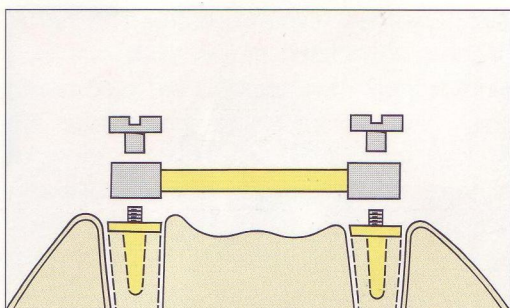


Fig. 143



Fig. 144

plant heads and remove bar complete with the collars for investing. (Fig. 143)

Paint the root caps and or collars with the investment mix being sure to fill in all grooves, angles etc. Place a small block of soldering investment onto a glass plate (to avoid possible changes to the water-powder ratio) and gently set the assembly in place as shown. (Fig. 144)

The soldering block should be as small as possible. It is easier to reach the working temperature and to control the soldering process.

After soldering is completed, bench cool.

When cool and before polishing, harden the attachment and root cap at 400 °C for 15 minutes in the porcelain furnace, and bench cool.

(See Part 1 – “Open flame soldering” and “Adjustment and Fitting of Attachments”)

Mounting Attachments in Cross Arch Connections – Transverse Locks

Most intracoronal and extracoronal attachments when used in unilateral free-end situations require additional support by way of a cross arch lingual or palatal bar connected to an attachment on the opposite side of the arch.

This connection provides stabilization which prevents lateral and torsional-rotation movements.

The following example is of a Dalbo S attachment connected by a palatal bar to a Roach ball attachment. (Fig. 145)

Important Notes

The attachments used must both follow the same path of insertion.

If the attachment used is a resilient or hinge type, the attachment mounted as a transverse lock must also be resilient to allow for the vertical and or rotational movements.

If a rigid attachment is used then the transverse lock can be either rigid or resilient.

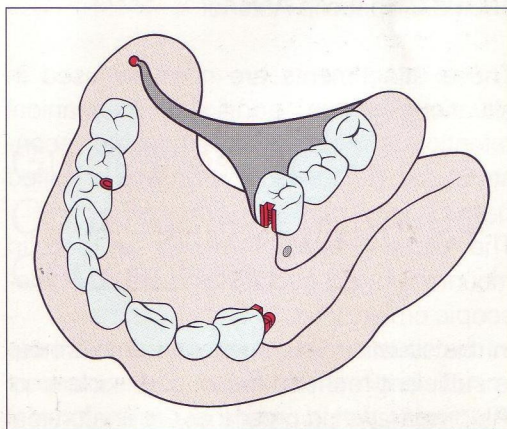


Fig. 145

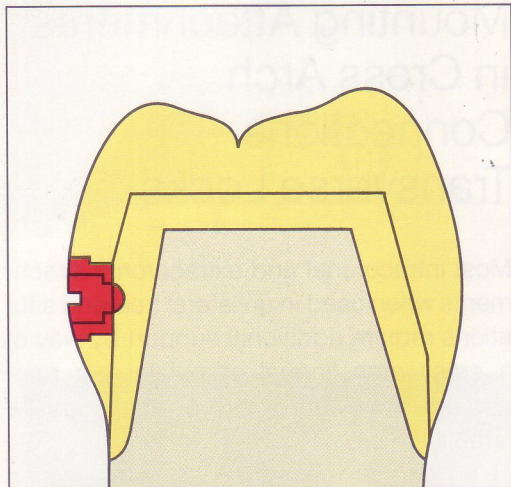


Fig. 146

Guidelines for Mounting Retentive Elements I

These basic guidelines apply to the following attachments:

- 102.02.1 Ipsoclip RE
- 102.02.2 Ipsoclip Posterior
- 102.03.2 Ipsoclip Anterior

These attachments are normally used in situations where additional mechanical retention is required on removable reconstructions. (I.e. telescopic crowns or milled bars.)

The following example shows an ipsoclip mounted in the secondary part of a telescopic crown. (Fig. 146)

In this situation you must ensure, that there is sufficient room on the buccal surface of the preparation in order that the anatomical shape of the crown is not overcontoured.



Fig. 147

Important notes

Ensure that, when mounted, the stud and spring can be easily removed for servicing or replacement. I.e. 102.02.1 or 102.02.2 should be mounted following on same line as (rear opening) lingually or palatally. 102.03.2 (front opening) is usually mounted in proximal spaces and is invisible when the removable section is seated. The spring and stud can therefore only be reached when the prosthesis is removed from the mouth.

Attachments must be completely disassembled prior to casting on or soldering. After casting and trimming the primary and secondary parts should be joined and a pin recess constructed for the rear opening attachments. (Fig. 147)

The primary casting should be spot drilled with a centre drill through the stud opening. Do not use a rose head drill as damage will be caused to the circumference of the stud hole.

When completed, remove the secondary part and paint a thin coating of graphite paste onto the primary part. Reassemble the attachment and join the two parts together. Remove the secondary part. A line will have been scribed in the graphite showing the insertion path of the stud. Cut a small "V" shaped groove along this line approx 1/3 of the depth of the stud recess to provide an insertion guiding groove for the stud.

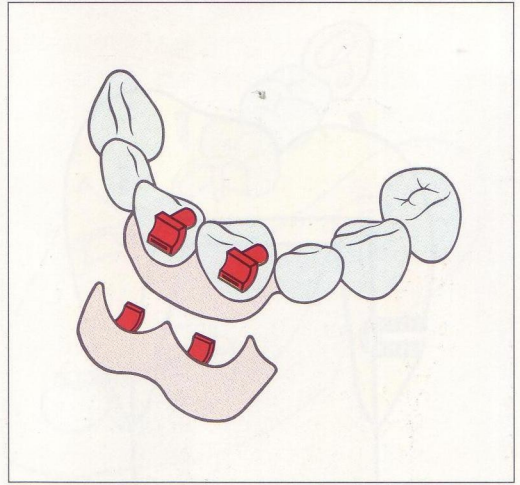


Fig. 148

Guidelines for Mounting Retentive Elements II

The following guidelines apply to the attachment:

102.04.2 Epiloc

This attachment is used to retain a gingival mask or gum slip in the anterior region, where the patient has suffered bone loss. It can only be mounted in a pontic section of fixed bridgework.

Where extensive bone loss has occurred, it is possible to use two attachments. (Fig. 148) However, great care must be taken to ensure that both attachments are mounted parallel. Wax up the housings temporarily into independent pontics. Fit both retention bands and connect them together with a bur shank or small flat bar and sticky wax. When fixed, lightly join the two pontics together with brittle wax. Check parallelism by removing and reinserting the retention bands. If the wax cracks, separate the pontics, check the connection of the retention bands and rejoin the pontics. Only when you are sure the bands are parallel, wax up to the desired contour.

After casting do not remove the investment from the housing until porcelain application is complete. This is to protect the inside of the housing from penetration of porcelain particles.

Heat and bend the retention band(s) to the desired contour in order that it can be completely enveloped and held securely in the acrylic resin. Cut supplementary retentions (holes, notches etc.) and heat treat at 400 °C for 15 minutes before processing.

Guidelines for Constructing Screwed Connections

Screwed connections are constructed for operator removeable restorations. Examples of which are shown below. (Figs. 149-151)

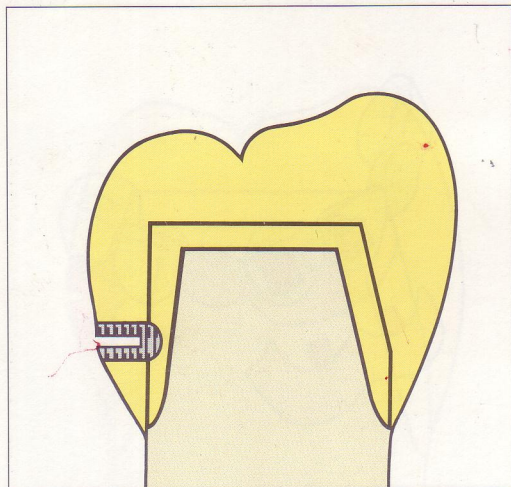


Fig. 149

Pin Screw

The pin screw is a section of threaded rod with a screwdriver slot. It is mounted horizontally in the secondary part of a telescopic crown. (Fig. 149)

To utilize a pin screw the following steps are taken.

Complete the construction of both primary and secondary parts of the telescopic crown. The minimum wall thickness of the secondary part must be no less than 1.2mm in the area where the pin screw is to be sited. Using the 1mm centre drill mark the position of the screw on the wall of the secondary part. Remove the secondary part and with the correct size spiral drill bore a hole through the wall. Insert the thread cutter into the holder and carefully tap the thread in the secondary part. Do not attempt to cut the thread in one go. Screw in 1/2 turn and out 1/4 turn, screw in 1/2 turn and out 1/4 turn and so on. When thread cutting has been completed remove any burrs from the inside of the secondary part with a scalpel. Fit primary and secondary part together. Select the centre drill corre-

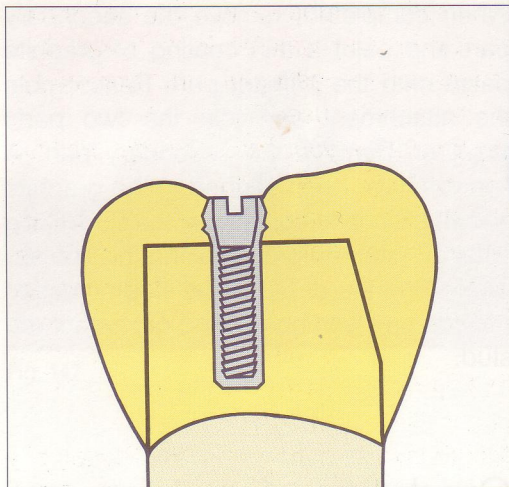


Fig. 150

sponding to the size of the pin screw and spot drill the primary part through the threaded hole. Remove the secondary part and slightly enlarge the spot diameter with a rose head burr. Reassemble the primary and secondary parts, insert the pin screw completely and adjust the length to the contour of the crown wall.

Screw and Tube System

This system in assorted lengths and diameters consists of a sleeve, countersunk collar and screw with a cylindrical conical head. The sleeve is cast or soldered vertically into the primary crown. The collar is cast into the secondary part to provide a seat for the screw head. (Fig. 150) When inserted and tightened the screw pulls the secondary part onto the primary crown. The screw head and screwdriver slot is lengthened to enable the finished construction to be adjusted to the contour of the crown. In cases where space is limited in the primary crown, the screw thread can be cut using screw taps instead of the sleeve.

To ensure the tube remains in the correct position during wax elimination and pre-heating when casting-on, the fixation pin must always be used.

Before starting your case consider the type of alloy that you are using.

With palladium-based alloys there is a risk, that the steel fixation pin can break off inside the threaded tube. This is caused by the contraction of the alloy around the tube. By using an alloy with a higher gold content (45% or more) this risk is reduced, but by no means eliminated.

Prior to investing, heat treat the fixation pin to form an oxide. Warm pin to red colour and quench in water. Use a liberal coating of Colloidal Graphite (80 241) or antflux on the pin and inside the tube to prevent a chemical bond between the pin and the tube.

After casting, devest carefully. *Do not attempt to remove the pin from the tube.* Place casting in an 18% solution of hot Hydrochloric acid (see note below) for 20 minutes in the ultrasonic. Bubbles will appear on the surface of the steel pin. These bubbles should be removed by shaking the vessel. If these bubbles are not removed they will prevent the dissolution of the steel. After the casting has been removed from the ultrasonic, it should be dipped in a solution of ordinary soda and water to neutralise the acid. If the steel pin has not completely dissolved or if it has broken off inside, the tube must be reamed out and retapped with a thread cutter.

Note

Hydrochloric acid is normally available from your local stockist in a concentration of 36%. Mix the concentrate in a ratio of 1:1 with distilled water. The concentration then becomes 18%. When heating acid with a higher concentration than 20%, the HCl

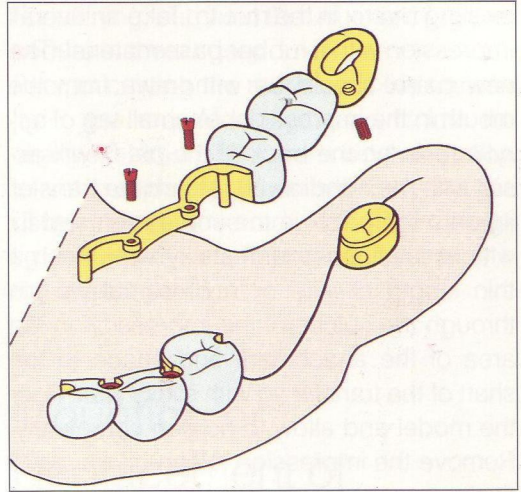


Fig. 151

part of the acid evaporates more than the H_2O and the acid becomes weaker.

Warning: Add acid to water, never water to acid.

Instructions for Use of Transfer Jigs I

To replace patrices and for relining cases with the following intracoronal attachments:

- 22.03.1 McCollum
- 22.03.2 McCollum
- 22.03.5 McCollum
- 22.09.2 PT Snap
- 24.01.5 Combi-Snap

To replace an intracoronal patrix, deactivate the new component and insert into the

existing matrix in the mouth. Take an overall impression with a rubber base material. The new patrix should be withdrawn from the mouth in the impression. (A small tag of acrylic resin on the back of the patrix will assist with the withdrawal). Attach the transfer jig onto the patrix in the impression and fix with a small amount of sticky wax. Push a thin length of wire or a dressmakers pin through the sulcus of the impression in the area of the attachment and attach to the shaft of the transfer jig with sticky wax. Pour the model and allow to harden completely. Remove the impression, clean off traces of sticky wax, acrylic and impression material from the patrix and proceed with the replacement into the prosthesis.

For relining, carry out the usual relining procedure in the surgery. Prior to casting the model, trim the transfer jig to the required size where necessary, attach to the existing patrix and cast the model. When completely set, carry out the usual relining procedure. Use of the transfer jig will ensure that the attachment remains in the correct position.

- 25.03.5 Screw Conex
- 25.08.2 Screw Regulex

To replace an extracoronal matrix, remove any adjustable parts or screws. Place the new component onto the existing patrix in the mouth. Take an overall impression with a rubber base material. The new matrix should be withdrawn from the mouth in the impression. Insert the transfer jig into the matrix in the impression and fix with a small amount of sticky wax. Push a thin length of wire or a dressmakers pin through the sulcus of the impression in the area of the attachment and fix to the shaft of the transfer jig with sticky wax. Pour the model and allow to harden completely. Remove the impression, clean off traces of sticky wax and impression material from the patrix and proceed with replacement into the prosthesis.

For relining, carry out the usual relining procedure in the surgery. Prior to casting, insert the transfer jig into the matrix and fix with sticky wax. Cast the model and allow to completely set. Carry out the usual relining procedure. Use of the transfer jig ensures the attachment remains in the correct position.

Instructions for Use of Transfer Jigs II

To replace matrices and for relining cases with the following extracoronal attachments:

- 23.02.2 Mini-Conex
- 23.02.5 Conex
- 23.03.2 Mini-Conex
- 23.03.5 Conex
- 23.06.2 Mini-SG slide
- 23.06.5 SG slide
- 23.08.2 Regulex
- 25.02.2 Flecher

Instructions for Use of Transfer Jigs III – Spacer Technique

To replace matrices and relining cases with the following anchor attachments:

- 31.01.2 Conod
- 31.02.8 Dalbo-Z
- 31.06.2 Baer
- 31.07.2 Stepped Eccenter
- 32.02.5 Gerber
- 32.07.4 Mini-Gerber

32.09.2 Micro Fix

41.02.8 Dalbo-Z

43.02.8 Dalbo-B

To replace an anchor matrix, place the corresponding plastic spacer onto the matrix in the mouth. Take an overall impression in a rubber base material. The spacer should be withdrawn from the mouth in the impression. Insert the transfer jig into the plastic spacer and pour the model. Allow to completely set. Remove the impression and spacer and proceed with the replacement of the matrix.

For relining, carry out the usual relining procedure in the surgery. Prior to casting, insert the transfer jig into the matrix and fix with sticky wax. Cast the model and allow to completely set. Carry out the usual relining procedure. Use of the transfer jig ensure the attachment remains in the correct position.

See Part 1 – “Servicing Attachments”.

Instructions for Use of Transfer Jigs IV

To replace channel sections of Dolder bar and relining cases with Dolder bar.

Cut new channel section to desired length and try in. Remove from the mouth and block out undercuts and retention holes with wax. Deactivate the channel with the adjusting tool. Fit in the mouth and check for ease of removal. Take a rubber base impression with the channel in place and withdraw from the mouth. The channel section should be withdrawn from the mouth in the impression. Cut the transfer jig to the correct length and fit into the channel in the impression. Pour model and allow to set completely. Remove impression, clean off all traces of wax and impression material and proceed with the replacement.

For relining, carry out the usual relining procedure in the surgery.

Prior to casting the model, cut the transfer jig to the required length and fit into the channel section. Pour the model and allow to set completely. When set carry out the usual relining procedure. Use of the transfer jig ensures the channel section remains in the correct position.

Mounting or Replacement of Dalbo-S Matrix

Remove coil spring from the matrix and replace with the steel stop (63.01.212). (Fig. 152) The steel stop is the same size as an uncompressed spring and is used to prevent any vertical compression of the matrix when taking an impression. Fit matrix to the patrix and ensure that the attachment is in the correct position.

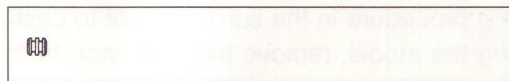


Fig. 152

Block out the underside of the distal extension of the matrix with temporary cement to prevent rotation of the matrix on the ball. (Fig. 154)

Take an overall impression and withdraw the attachment matrix in the impression material. Withdraw the steel stop and replace with the transfer jig (63.01.22). (Fig. 153) Secure the jig with sticky wax to prevent it from working loose when pouring model material.

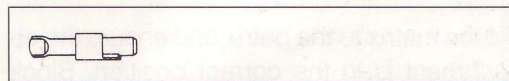


Fig. 153

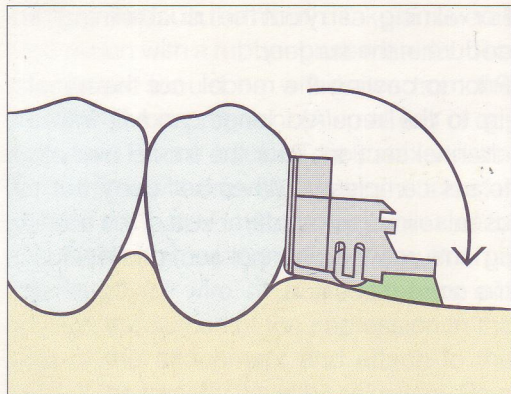


Fig. 154

Pour model material into impression taking care, that the jig does not move. When set, remove impression and take out the attachment matrix and reseal onto the jig. You will see that the attachment will only seat in one position and will not rotate. Proceed with the replacement into the prosthesis.

For relining, replace the spring in the matrix with the steel stop. Carry out the usual relining procedure in the surgery. Prior to casting the model, remove the steel stop from the attachment and replace with the transfer jig. Cast the model and allow to completely set. When set carry out the usual relining procedure. Use of the transfer jig ensures that the attachment remains in the correct position.

Mounting or Replacement of Mini-Dalbo Matrix

Fit the matrix to the patrix and ensure the attachment is in the correct position. Block out the underside of the distal extension

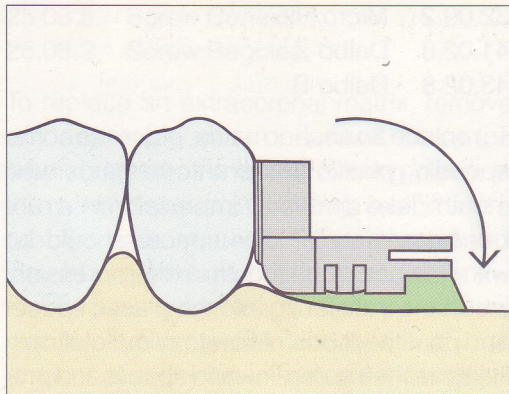


Fig. 155

with temporary cement to prevent rotation of the matrix on the ball. (Fig. 155)

Take an overall impression and withdraw the attachment matrix in the impression material. Insert processing jig (83.01.22) (Fig. 156) into the matrix. Secure the jig with sticky wax to prevent it from working loose when pouring the model material into the impression.

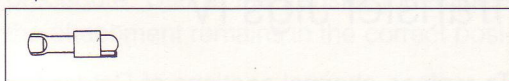


Fig. 156

Pour model material into impression taking care, that the jig does not move. When set, remove impression and take out the attachment matrix and reseal onto the jig. You will see that the attachment will only seat in one position and will not rotate. Proceed with the replacement into the prosthesis.

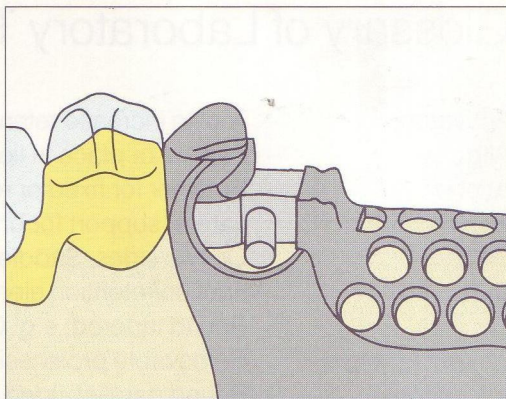
For relining, carry out the usual relining procedure in the surgery.

Prior to casting the model, fit the transfer jig into the existing attachment. Pour the model and allow to set completely. When set carry out the usual reline procedure. Use of the transfer jig ensures the attachment remains in the correct position.

Readers Additional Notes

From time to time modifications are made to the design of attachments which you may wish to record on this page.

E.g. SG slide attachment 23.06.5 matrix housing has now been redesigned so that it can be composited to a chrome cobalt casting instead of soldering, which can destroy the physical properties of the matrix and therefore its springiness or "memory".



Modified SG 23.06.5.

Glossary of Laboratory Terms

Activator	Tool to increase retention.
Align	Parallel or place in line.
Anchor	Retainer for fixed or removable appliances.
Abutment	Lateral support for bridge.
Bilateral	On two sides. Saddles joined by metal or acrylic connector.
Cone	Friction/retention element.
Conical	Round tapered, e.g. CM Mooser Post.
Coupled (hinge)	Removable prosthesis with independent hinged saddles.
Cylindrical	Round parallel sided, e.g. CM Dalbo-Z anchor.
Cylindrical-conical	Round parallel tapered, e.g. CM Post.
Dove tail	Tenon shape or reversed wedge fitting into mortice.
Deactivator	Tool to decrease retention.
Extra coronal	Outside the circumference of a tooth.
Eccentric	Groove with localised retentive area as in the Föh and Rotherman attachments.
Friction-grip	Retained by friction.
Fixed	Screw-retained or cemented.
Free-end	Bridge or saddle supported one end.
Intracoronal	Within the circumference of a tooth.
Interdental (space)	Between two teeth.
Joint	Hinge or link between elements.
Locking screw	For securing semi-permanent operator removable sections.
Milling	To machine cut or shape wax or metal.
Matrix	Female part of attachment.
Mandrel	For aligning attachments.
Non resilient	Rigid.
Patix	Male part of attachment.
Paralleling	To align two or more elements to each other.
3D paralleling	To parallel in vertical, sagittal and horizontal planes.
Resilient	Rotational and vertical movement.
Retention grip	Retained by spring device.
Root cap	Cast onto a post usually to support an anchor.
Stabilizer	Component part of a brace support. See page – "Milled brace support".
Spacer	a) Metal or plastic part to separate two elements, e.g. CM Dalbo-B 43.02. b) Ceramic (aluminium oxide) element for shaping the female part of an attachment. CM-Box 22.11.
Socket key	Tool for removing cones.
Transfer jig	Dummy metal piece used to support an attachment on a model.
Unilateral	Single sided free-end saddle.

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Cendres & Métaux SA Courses

Attachment and Milling courses are held in the U.K. and Biel-Bienne, Switzerland. For U.K. contact Precious Metal Techniques for further information. Telephone: 071 486 3881.

We, the writers, wish to express our appreciation for the assistance given by Mr Dino Fumasoli of CM and for the Companies permission to access their photographic library. We also to state that this technical manual should not be considered

as definitive. It is well known, that many complex cases cannot be designed to a rigid set of rules. Designs and fabrication demand a degree of flexibility which must be allowed for, to the extent that occasionally an element of compromise has to be acceptable.

We trust this book will be a useful guide to all technicians and clinicians involved in attachment techniques.

However, remember, that attachment work is rather like a game of chess. Always anticipate the future beyond your next move.

G.M. Sherring-Lucas

P.A. Martin

Acquiring information relating to attachment procedures has always been difficult. In fact very little has been written, which includes basic information on the use of attachments and their associated techniques. The writers, Mike Sherring-Lucas and Paul Martin have endeavoured to fill that gap by describing in considerable detail all aspects of attachment work including planning and design for the technician with limited knowledge. There also is much written, that would benefit the experienced technician and clinician as the book has been written in conjunction with the CM catalogue and therefore becomes a very useful reference book for all involved in the fabrication of precision attachment cases.

The purpose of the book is to make the subject understandable. To assist the reader over 150 coloured drawings and illustrations have been included.

The book opens by explaining the intricacies of model analysis, planning and design, from simple split bridgework to complex prospectively planned cases, followed by attachment selection and then considers laboratory procedures, including milling, in great detail.

For convenience the book has been written in two parts. The 1st refers to planning, techniques, materials and equipment and the 2nd compiled in conjunction with the CM catalogue, deals with model construction, use of the parallelometer and classes of attachments, with cross referencing throughout.

This is a book written by technicians for technicians and if used alongside the magnificently illustrated and detailed CM catalogue will be a valuable educational asset as a reference book in the laboratory, surgery, hospital and university.